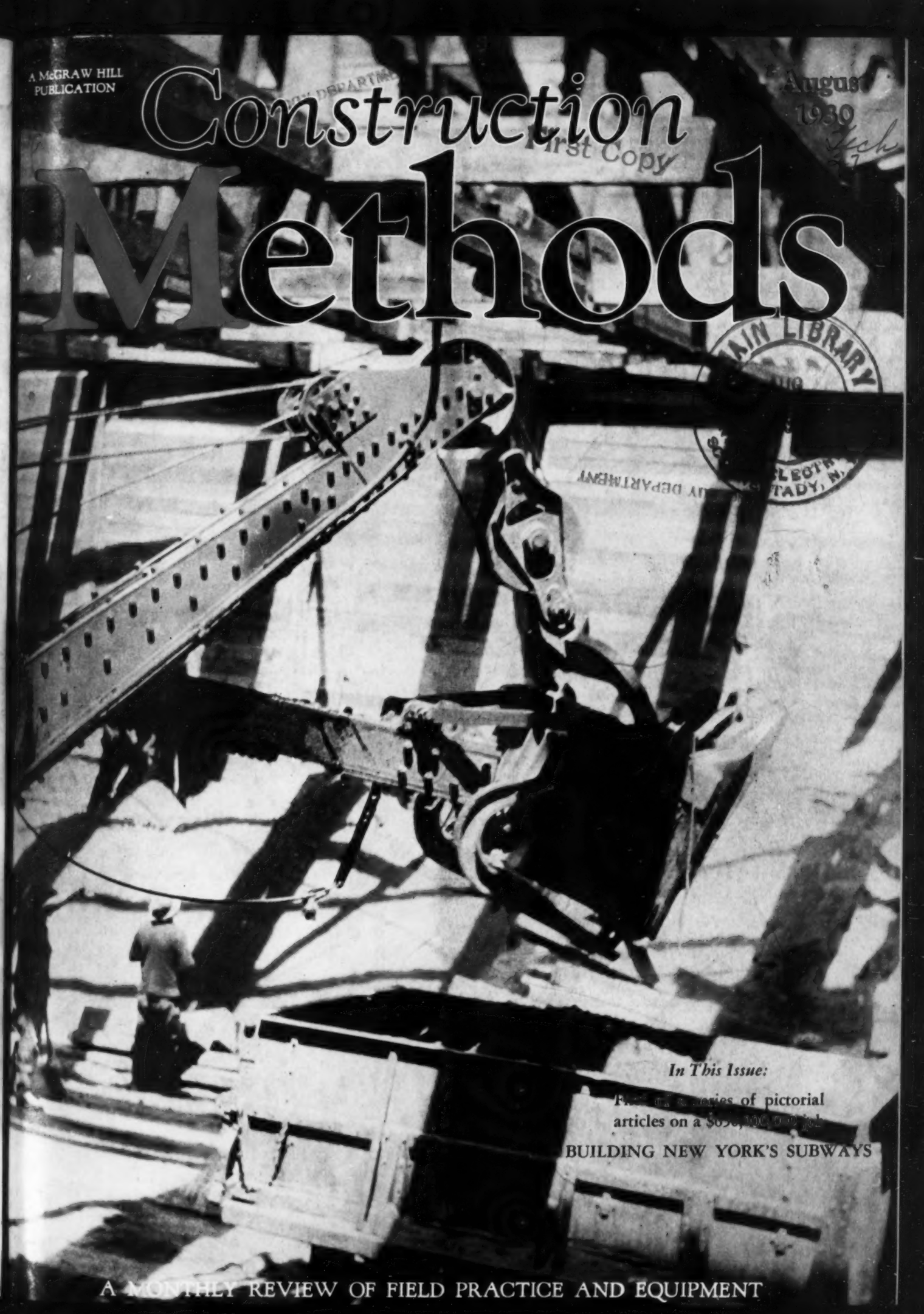
A McGRAW HILL PUBLICATION

Construction Methods

August 1930

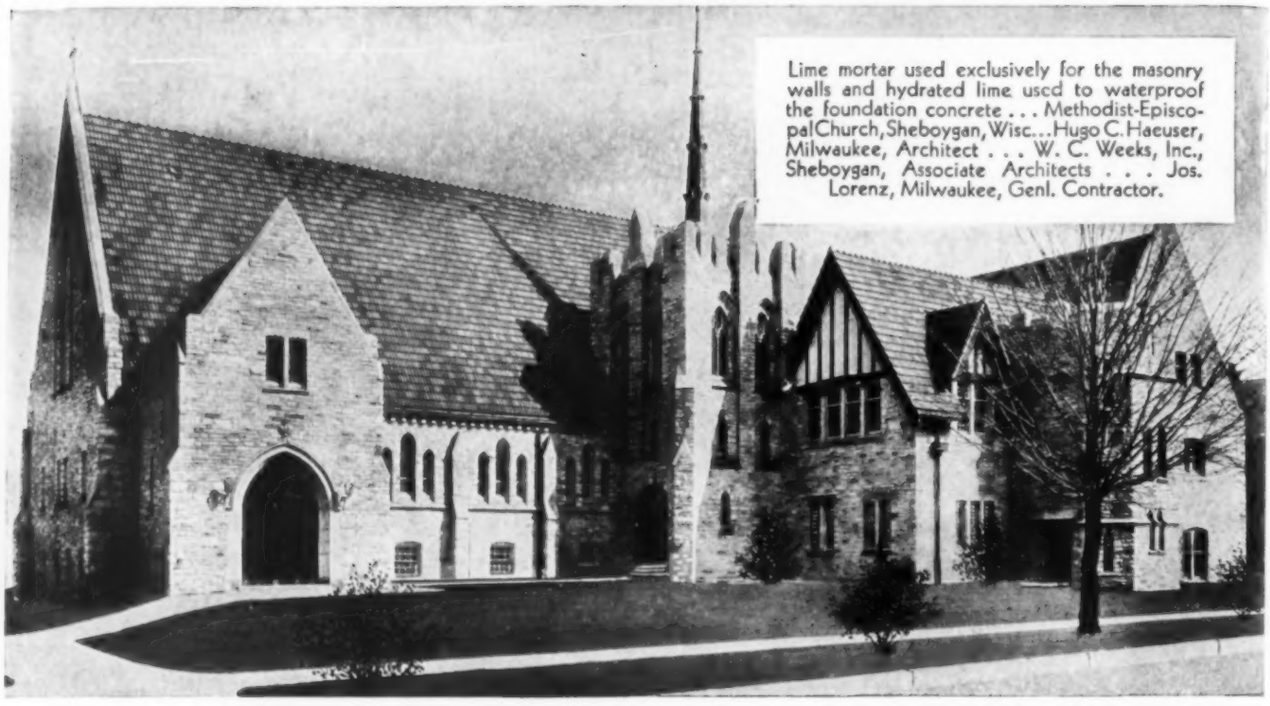


In This Issue:

P[illegible] series of pictorial articles on a $[illegible]

BUILDING NEW YORK'S SUBWAYS

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT



Lime mortar used exclusively for the masonry walls and hydrated lime used to waterproof the foundation concrete . . . Methodist-Episcopal Church, Sheboygan, Wisc... Hugo C. Haeuser, Milwaukee, Architect . . . W. C. Weeks, Inc., Sheboygan, Associate Architects . . . Jos. Lorenz, Milwaukee, Genl. Contractor.

LIME--For Enduring Quality in Mortar

THIS beautiful stone church will stand for years and bear testimony to the wisdom of the builders in having insisted on lime mortar as the bonding agent.

The architectural beauty of many buildings is frequently lost or greatly marred through the defacing discoloration termed "efflorescence."

Mortars rich in lime insure against this disfigurement and also the ensuing disintegration of the bond so essential to permanency.

Lime mortar also overcomes one of the most serious problems facing the construction industry today—that of leaking walls.

Toughness, elasticity and adhesiveness, so distinctive of lime mortar, are essential requisites for dry walls.

Very recent tests, of a highly authoritative nature, have confirmed the findings of the builders of years ago who knew and used lime mortar exclusively. Examples of old buildings still in a fine state of preservation attest to the permanency of lime mortar.

Rely on LIME
-tested by time

Full details on this important subject which is now engaging the serious attention of architects, engineers and contractors, are given in our new booklet, "Mortars and Masonry". Write today for your copy.

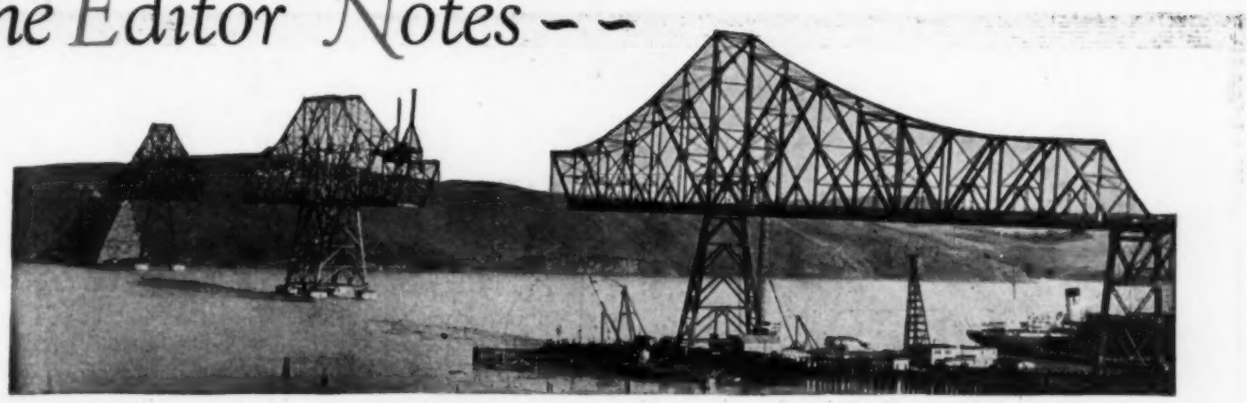
NATIONAL LIME ASSOCIATION

An organization of leading lime manufacturers formed to encourage a better appreciation of the economic value of lime in all its uses.

62-A 715 CARRY BUILDING « WASHINGTON, D.C.

CONSTRUCTION METHODS, August, 1930. Vol. 12. No. 8. Published monthly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at Thirty-sixth Street, New York, N. Y. $1 per year; 10 cents per copy. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 19, at the Post Office at New York, N. Y., under the Act of March 5, 1879. Printed in U. S. A.

The Editor Notes - -



Construction Starts at Boulder Dam

AS the culmination of 20 years of research by the U. S. Bureau of Reclamation, actual construction was begun last month on the Boulder Dam, the outstanding feature of the $165,000,000 Colorado River irrigation and power project which will open up a new era of development in the Southwest. Ending nine years of congressional debate the Senate, on June 27, passed and the President approved an initial appropriation of $10,660,000 to cover the cost of preliminary work, including diversion tunnels, railroads, highways, town site and power plant. Thus the way is now clear for completing the largest and most-talked-about government construction project since the Panama Canal.

World's Largest

Boulder Dam, itself only a part of the huge project, will be the largest dam in the world, measuring 727 ft. in height from bedrock to crest and 1,225 ft. in width. Located 25 miles southeast of Las Vegas, Nev., it will form a 3,500,000-cu.yd. concrete wedge in a 2,000-ft. canyon, constituting the boundary line between Nevada and Arizona. The design provides for a curved, gravity structure. According to present estimates it will take 2¾ years to complete the dam and 7 years for the entire water and power project. When construction gets into its full stride it will provide employment for 1,000 men. In this connection Commissioner Elwood Mead, of the Bureau of Reclamation at Washington, warns construction men against making a trip to Boulder Dam to seek employment without ample provision to meet the emergency should this quest fail. Employment will develop only after contracts are let.

When completed, the huge dam will form a lake 115 miles long, with a capacity of about 29,000,000 acre-ft. of water, enough to hold the entire flow of the Colorado River for 1½ years, thus making it possible to equalize the flow for irrigation and for developing a million horsepower of hydro-electric energy.

80-Mile Canal

In addition to the dam and the power house at its base another important feature of the project is the 80-mile All-American canal, which will divert water from the Colorado River at the existing Laguna dam, 9 miles northeast of Yuma, Ariz., and deliver it to the Imperial and Coachilla valleys in California.

For the $165,000,000 Boulder Dam project the major cost items are: Dam and reservoir, $70,600,000; power plant, $38,200,000; All-American canal, $38,500,000; interest during construction, $17,700,000.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

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WILLARD CHEVALIER, *Publishing Director*

A McGraw-Hill Publication

Tenth Avenue at 36th Street, New York

From Darkest Africa

FOREMEN who complain of difficulties with common labor in this country should cheer up after reading the following note from a subscriber in British East Africa:

"During excavation for a foundation done by native hand labor it was found that the 'boys' had never seen a shovel before. Their method was to place the shovel on the ground, fill it with their hands and then throw it clear. They have no powers of observation and consequently they try one's patience to the last degree."

Pre-Qualification Required in South Carolina

SOUTH CAROLINA last month joined the group of progressive states that require pre-qualification of contractors bidding on road or bridge construction, as advocated by the Associated General Contractors and the U. S. Bureau of Public Roads. Contractors who qualify for the award of state construction under the new regulations are given a rating designed to indicate the kind and quantity of work which they are able to perform. Eligible contractors are classified in four groups: General (any class of work); grading and minor drainage structures; paving (including grading); and bridge building.

International Road Congress

OFFICIAL DELEGATES have been named thus far by 40 nations to attend at Washington, D. C., Oct. 6-11, the Sixth International Road Congress and the exposition of road machinery and materials to be held by the American Road Builders' Association.

In addition to papers on the leading highway problems, there will be an equipment exposition giving a representative picture of the machinery and the materials of the road building industry in the United States.

Our federal government representatives in every foreign station are assisting in distributing news of the Congress and stimulating interest in worldwide attendance among highway engineers and government officials.

The Future Skyscraper

"AS AN ENGINEER I know that tall buildings can safely be built to a height of 2,000 ft.—200 stories or more."—*George E. J. Pistor*, treasurer, American Institute of Steel Construction.

Time to Build

NOW AND THEN it is worth while to forget the business cycle, or at least to discard its terminology, and take a homely look at facts. Such a time is at hand. Regardless of trends or causes of trends, the construction industry is short of work. Money is not being spent for homes, for factories or for office and apartment buildings in anywhere near normal volume. And the reason, regardless of what we call the present stage of the business cycle, is plain. Everyone is waiting for a bargain.

It is now nearly a year since deflation began. The various indexes of business activity—steel mill operations, building contracts, electric power output, car loadings, commodity prices, interest rates—have steadily declined. Considering only building materials, in October, 1929, the basic steel price was $1.90; it is now $1.65. Brick was $14.50; it is now $13. Pine has declined 6.5 per cent, fir 18.5 per cent. Hollow building tile prices alone have remained stable. Cement at $1.95 is higher than it was in October, but is below the $2.05 price which held from 1925 to September, 1929. Briefly, not since 1922 have building materials prices been so low. Other factors in construction point to advantages over recent years. Manufacturers of equipment and accessories, anxious to keep plants going and men employed, have reduced prices. Labor itself, working under the threat of possible unemployment, is more efficient than for several years past. Slack business has fostered keen competition among contractors and fabricators who are waiting hungrily for invitations to bid.

Granted a bargain day has arrived, can we expect bigger and better bargains to follow? Economists generally are answering this in the negative. They are pointing to several factors which indicate that bottom has been reached. Credit conditions, which are fundamental to increased business, are wholesome. The rate of credit expansion, after a year of decline, has now reversed itself and is nearly normal; in step with business, both should move ahead. Resistance to further decline in commodity prices is seen in the upturn of some of them. Signs of an increase in residential building are reported by mortgage companies and building loan associations. Crops are going to be good, which means revenue for the railroads if not for the farmers.

It is worth while to keep in mind that business has now been marking time for nearly a year. Such an unusual situation in a country so completely convinced of the close relationship among prosperity, construction and industrial activity is not normal and must eventually change. The facts cited above herald the change. The tide is on the turn. It is time to build.

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July 10, 1930

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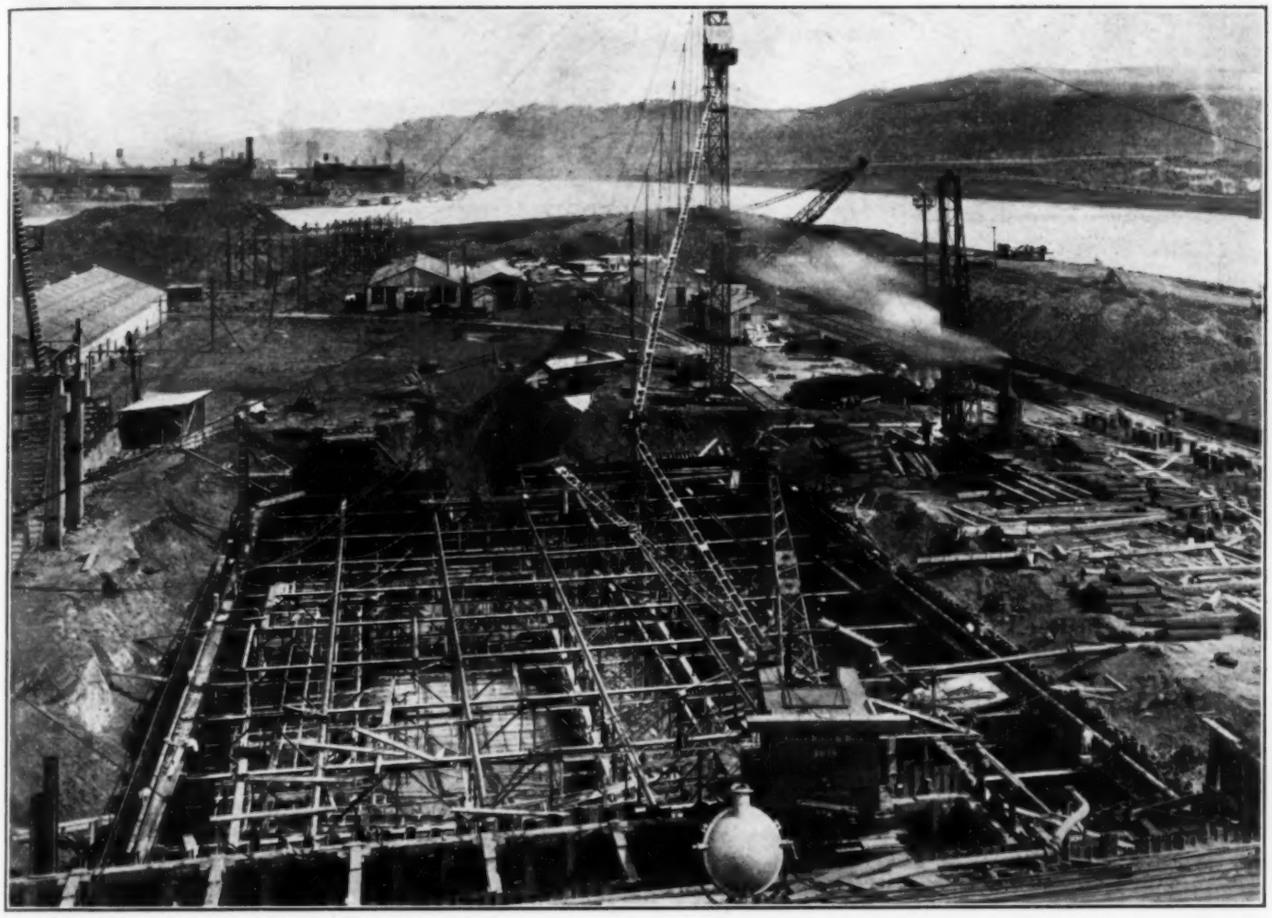


PITTSBURGH POWER STATION

The big, James H. Reed Power Station featured in the July issue of Construction Methods was built on an island in the Ohio River. The contractors used a FIVE-PUMP MORETRENCH WELLPOINT SYSTEM to lower the ground water level about thirty feet to a point below subgrade. The outfit held the water at this point, permitting the contractor to put in the concrete and do the waterproofing in the dry.

The increasing use of the MORETRENCH WELLPOINT SYSTEM on important jobs is positive proof that there is no longer any doubt in the minds of engineers, architects and contractors with regard to its efficiency. They know it—specify it—use it—depend upon it—

To Make Dry Ones Out of Wet Ones Under Any Condition!

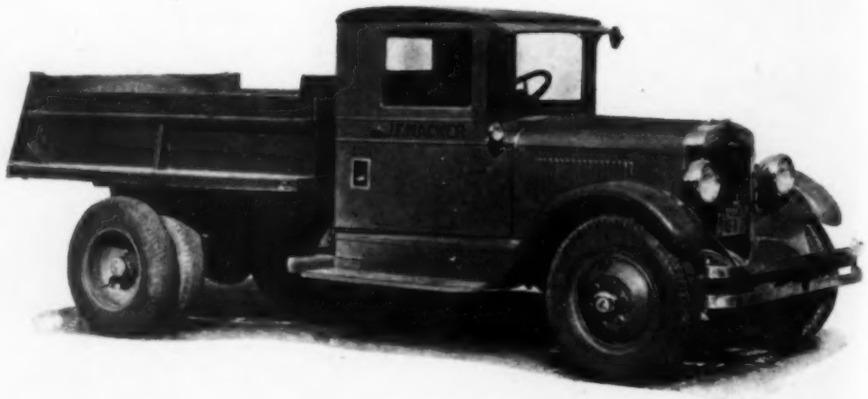
Moretrench

MOORE TRENCH MACHINE CO., *Rockaway, N.J.*

CONVEYING EXCAVATORS

WELLPOINT SYSTEM

This 6-cylinder Autocar has a 150-inch wheelbase, 36x8.25 pneumatic balloons, dual rears, a smart, Autocar de Luxe Coupe-type Cab and a 2½-yard dump body with St. Paul hoist. It is proudly owned and profitably operated by J. F. Nacker, contract hauler of Portland, Oregon.



Try Them All If You Want To . . . Your Final Choice Will Be Autocar

When you hear about contractors who have been using Autocars for fifteen years and more, you know that their first trucks were Autocars and that they have been buying Autocars ever since.

When a contractor's first Autocar is a 1930 model you know that he has tried most of the other good trucks and been satisfied with none of them. » » » Buy other trucks if you want to, but when it is so highly probable that you will eventually turn to Autocars, isn't it a waste of time and money to buy anything else in the first place?

Alone worth the price of the chassis, is the Autocar "Blue Streak" Six—a new engine designed and built by Autocar to meet today's demands for carrying greater loads at higher speeds with more efficiency and economy. » » » Write for descriptive literature.

PRECISION BUILT

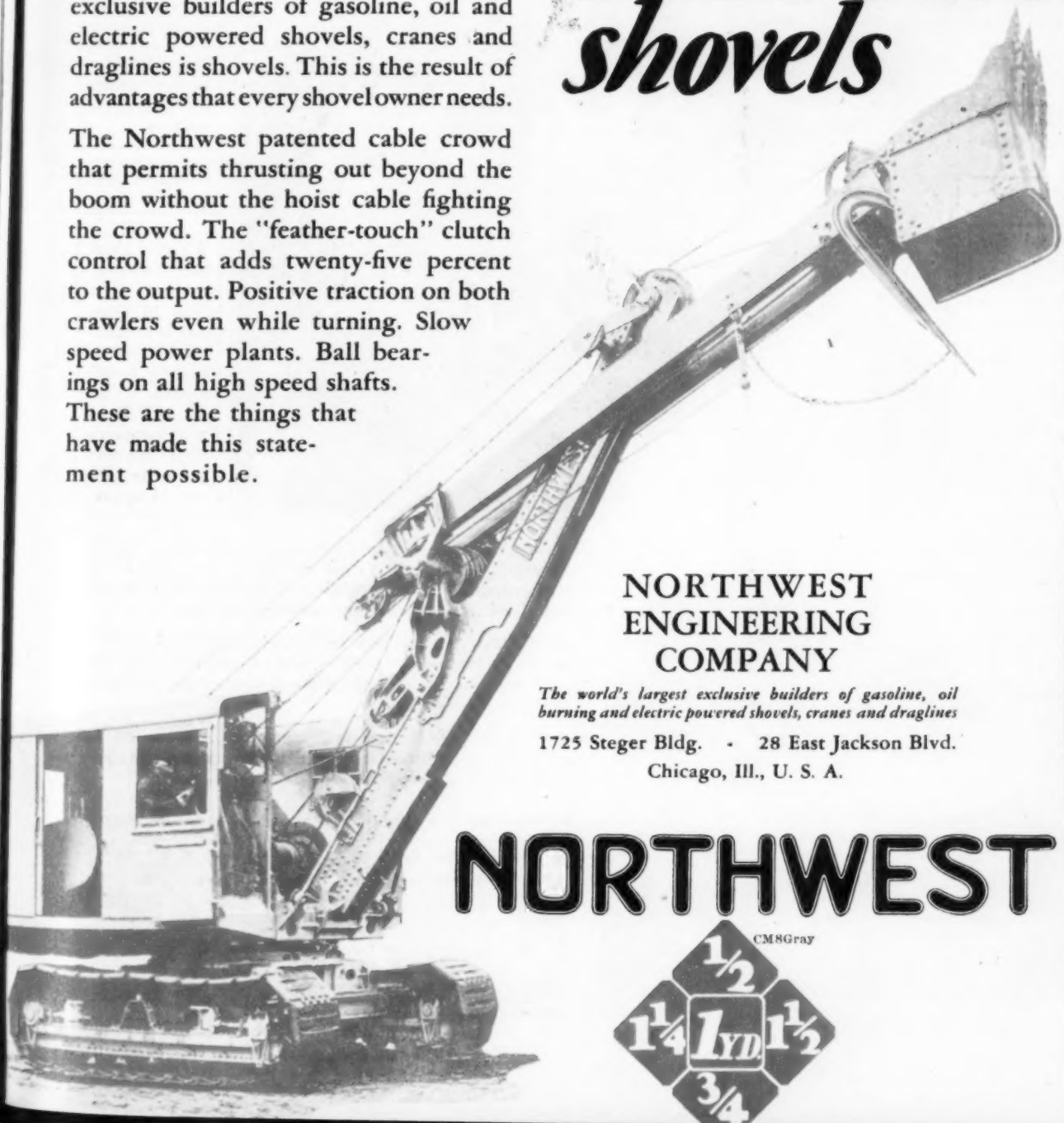
AUTOCAR TRUCKS

THE AUTOCAR COMPANY, ARDMORE, PA.

over 50% of all NORTHWEST sales are shovels

ONLY an exceptional machine could establish such a record! Fifty per-cent of the output of the world's largest exclusive builders of gasoline, oil and electric powered shovels, cranes and draglines is shovels. This is the result of advantages that every shovel owner needs.

The Northwest patented cable crowd that permits thrusting out beyond the boom without the hoist cable fighting the crowd. The "feather-touch" clutch control that adds twenty-five percent to the output. Positive traction on both crawlers even while turning. Slow speed power plants. Ball bearings on all high speed shafts. These are the things that have made this statement possible.



NORTHWEST ENGINEERING COMPANY

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

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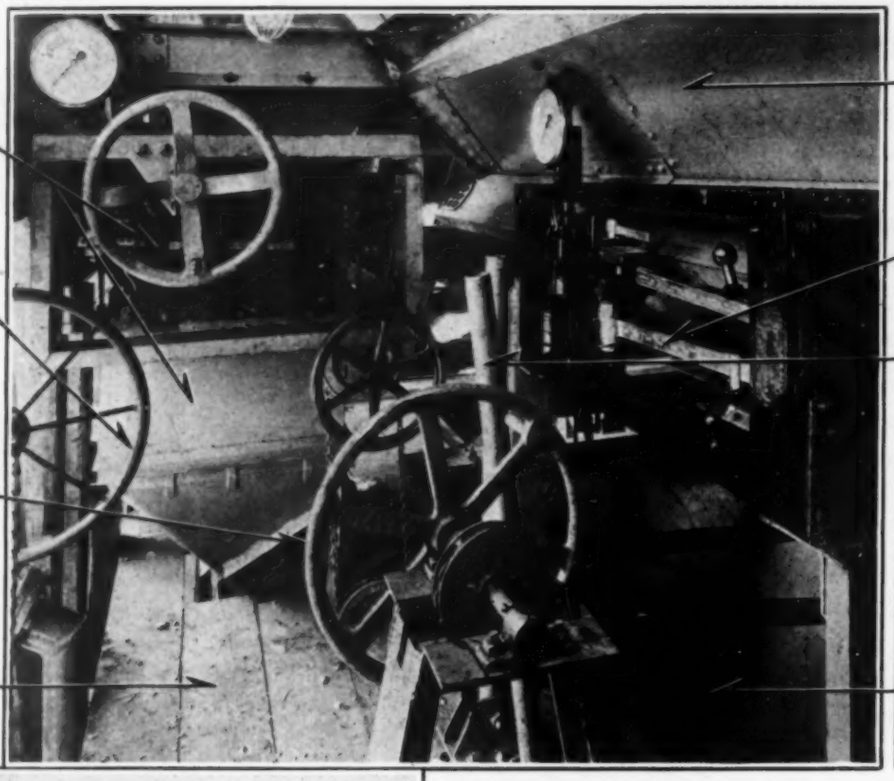
NORTHWEST

CM8Gray

1/2 1 1/4 1 YD. 1 1/2 3/4

The best part of a CENTRAL MIXING PLANT is BLAW-KNOX *design*

The convenient arrangement of the proportioning plant controls is a feature of the Northern States Contracting Company's central mixing plant at the Twin City Lock and Dam—on the Mississippi at Minneapolis.



2000 pound Weighing Batcher for Bulk Cement

Mixer Discharge Control.

Control for Discharging weighed aggregates direct into mixer drum.

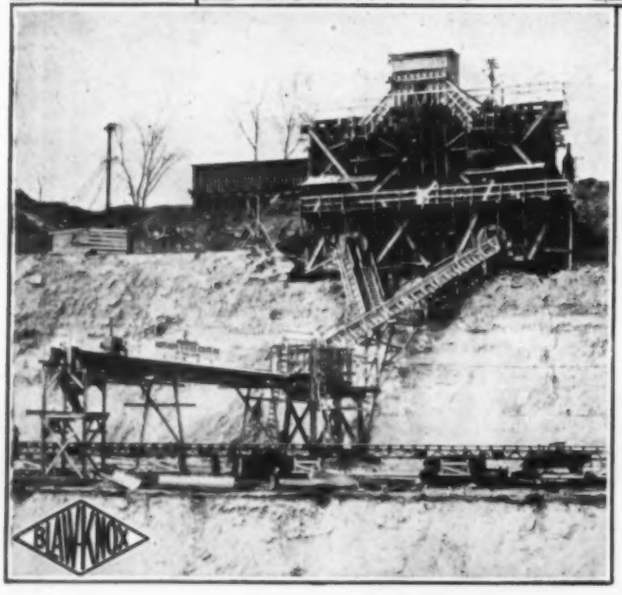
Operators platform convenient to all operating controls.

250-ton Self Cleaning, two-compartment Steel Storage Bin.

Multiple beam scales for aggregates.

Bin gate controls.

Weigh Hopper for aggregates. Top of hopper is just below bin gates, saving headroom. The Weigh Hopper replaces the usual mixer receiving hopper.



The twin Central Mixing Plant for the Northern States Contracting Company is an excellent illustration of the engineering ability which combines Blaw-Knox Equipment into an efficient concreting unit.

Two 250-ton Blaw-Knox Self Cleaning Steel Bins—Blaw-Knox Hopper Type Weighing Equipment feeding two 2-yd. mixers—and Blaw-Knox Bulk Cement Measuring Equipment.

Blaw-Knox Central Mixing Plant design is based on the experience gained in building concreting layouts for hundreds of construction jobs.

This engineering service is at your disposal—for the asking

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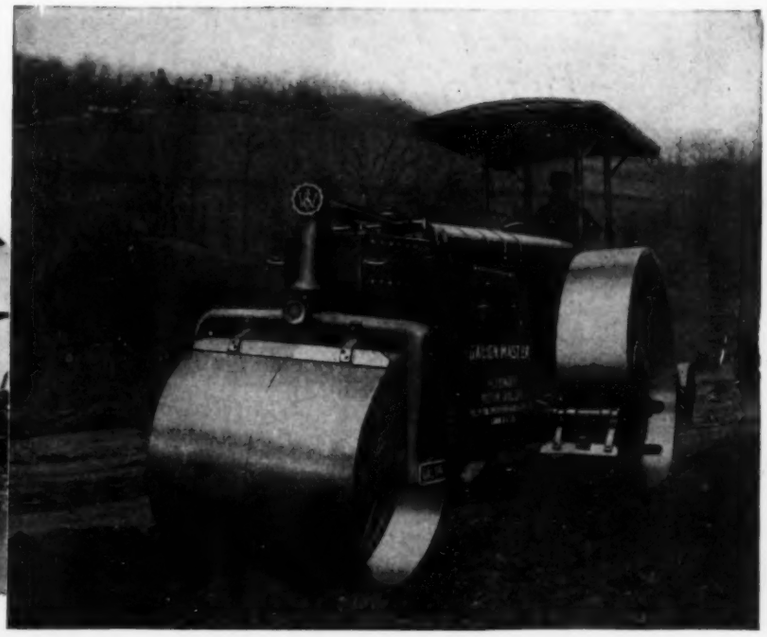

Give that Tough Job . . to a **Galion Master Roller . . .**

Practically every type of roller service is accomplished by the Galion Master Roller. In the above illustrations the Galion Master is shown in actual operation on a few of the tough jobs.

Whether it is climbing stone—bull-dozing—rolling down earth fills—close-to-curb rolling—rolling steep grades—drawing big road graders in action—scarifying—packing ditches—rolling asphalt—etc., the Galion Master is easily master of them all.

The Galion Master has ample power to go where it is needed. Abundant power is furnished from a 55 H. P. 4-cylinder, heavy duty, slow speed motor. Heavy duty Twin Disc clutch—gives extra capacity and smooth engagement under load. Machine-cut, heat treated gears of special alloy steel used throughout transmission and differential.

Otner special Galion Master features are: Alemite oiling system; two separate brakes, either sufficient to give complete control; thoroughly braced, heavy steel, one-piece frame assembly.

Segment worn steering—easy, immediate action—no chains to wind; front rolls of gray iron, operate independently on high carbon nickel steel axle; 72-inch rear rolls with double refined wrought iron spokes; roller and ball bearings used in abundance—phosphor-bronze bearings in rolls.

Galion Master Rollers can be furnished in 10 or 12 ton sizes with or without powerful and efficient scarifier attachment.

Write for further information about Galion Master Rollers and other Galion Road Machinery.

The Galion Iron Works & Mfg. Co.

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Build with
STRUCTURAL STEEL
for safety-economy and permanence

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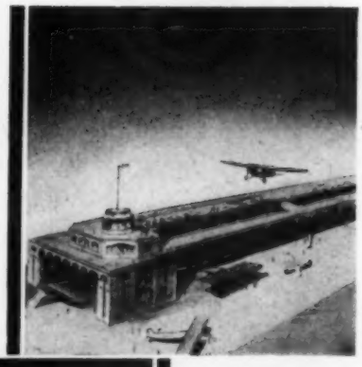
CONSTRUCTION today is not the leisurely process of past generations. Invested capital demands prompt occupancy. Structural Steel can be quickly and economically erected. Its strength is a known factor, making safety merely a matter of calculation. Structural Steel is adaptable, permitting free architectural expression. It lends itself readily to alterations and additions.

The most recent contribution to Structural Steel came with the introduction of Carnegie Beams. These sections possess many unique advantages. Their wide parallel flanges simplify fabrication and erection. Constant-depth columns afford opportunities for duplication in design, fabrication and erection. A wide range of sizes permits close approximation of required weight. Carnegie Beams merit the investigation of those interested in efficient and economical steel construction.

CARNEGIE STEEL COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation 81



WAYNE COUNTY AIRPORT—DETROIT

Giffels & Vallet, Inc., Engineers.

Gallagher-Fleming Co., General Contractors.

R. C. Mahon Company, Steel Fabricators.

KINGSBURY HALL UNIVERSITY OF UTAH SALT LAKE CITY

Anderson & Young, Architects.

W. J. Dean & Vernon Dean, General Contractors.

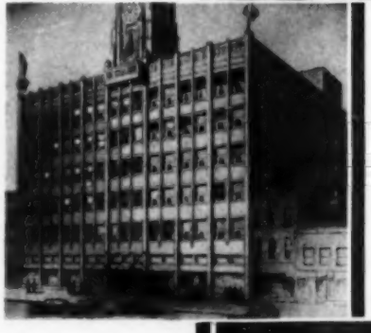
Provo Foundry & Machine Co., Fabricators.

BRINKMAN ARENA ST. LOUIS

H. W. Hollingsworth, Southwest Engineering Co., Struct'l Engineer.

Stupp Bros. Bridge & Iron Co., Gen'l Contractors.

Mississippi Valley Structural Steel Co., Fabricator of Roof Trusses.



BOSTON STORE ERIE, PA.

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Sessinghaus & Ostergaard, Inc., Gen'l Contractors.

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Erie Steel Construction Co., Fabricators.

MODERN SECTIONS for MODERN CONSTRUCTION

CARNEGIE BEAMS

HEATING PLANT OTIS ELEVATOR CO. HARRISON, N. J.

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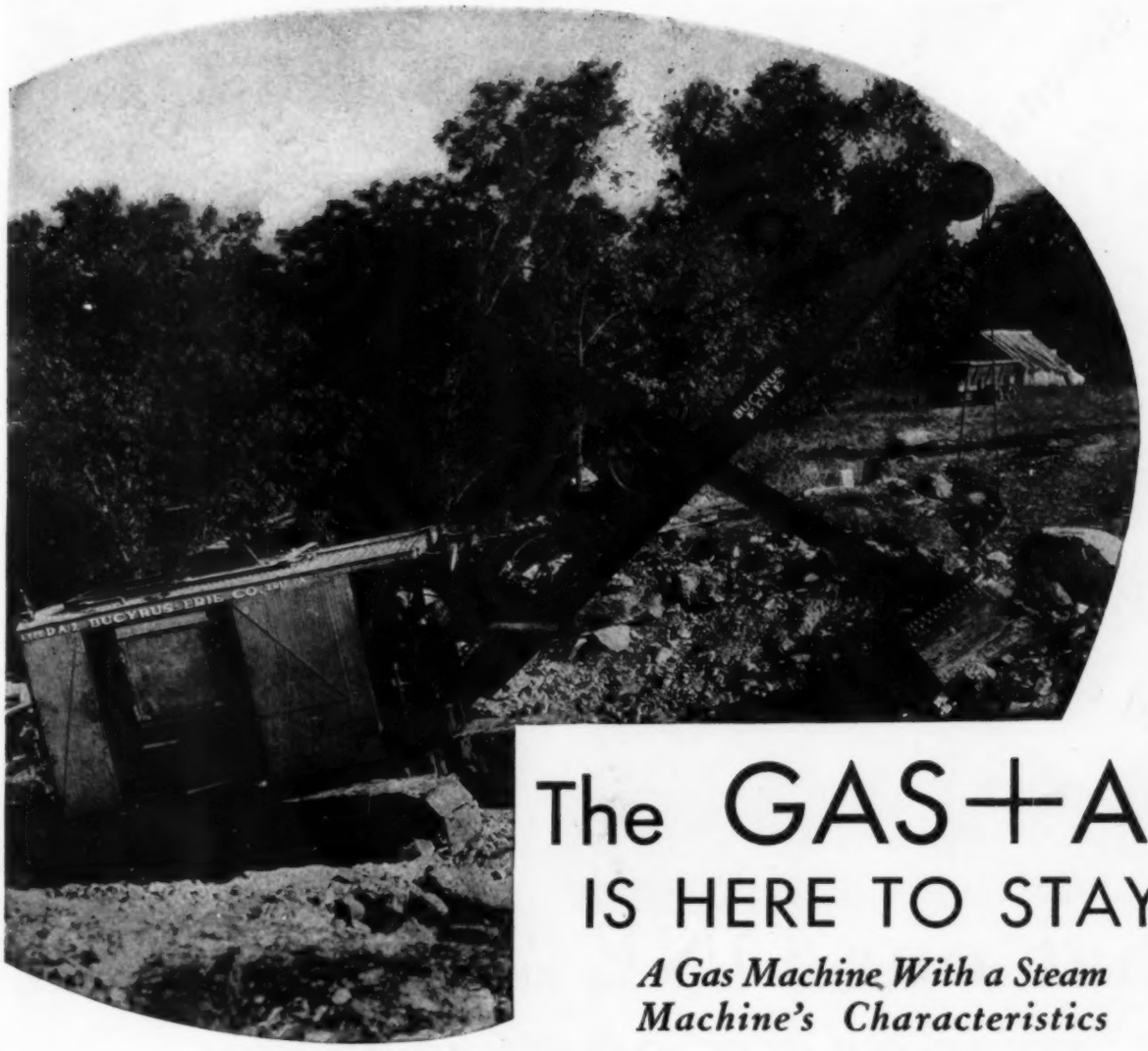

The GAS+AIR IS HERE TO STAY

A Gas Machine With a Steam Machine's Characteristics

Five years ago announcement was made of the world's first Gas +Air Shovel. Not a single new principle was employed — only a NEW combination of old and tried principles of proved reliability.

Among those who were first to acclaim the Gas+Air were many who remembered the difference between the one-engine and three-engine steam machines; and many who had waited for the day when someone would produce a gas or Diesel shovel with the crowd and swing characteristics of a steam machine — "if it could be done". It HAS been done — and these machines have proved they are here to stay! . . . During the past five years hundreds of these machines have been put into operation . . . The skeptics have tried them—the unbelievers have given them a merciless third-degree. Now no doubt remains. The fact has been established that for big production in heavy digging these machines have no equal.

They have proved they have the stuff that champions are made of. Their pedigree is written by 11,000 other successful machines.

Representatives throughout the U. S. A. and offices or distributors in all principal countries. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

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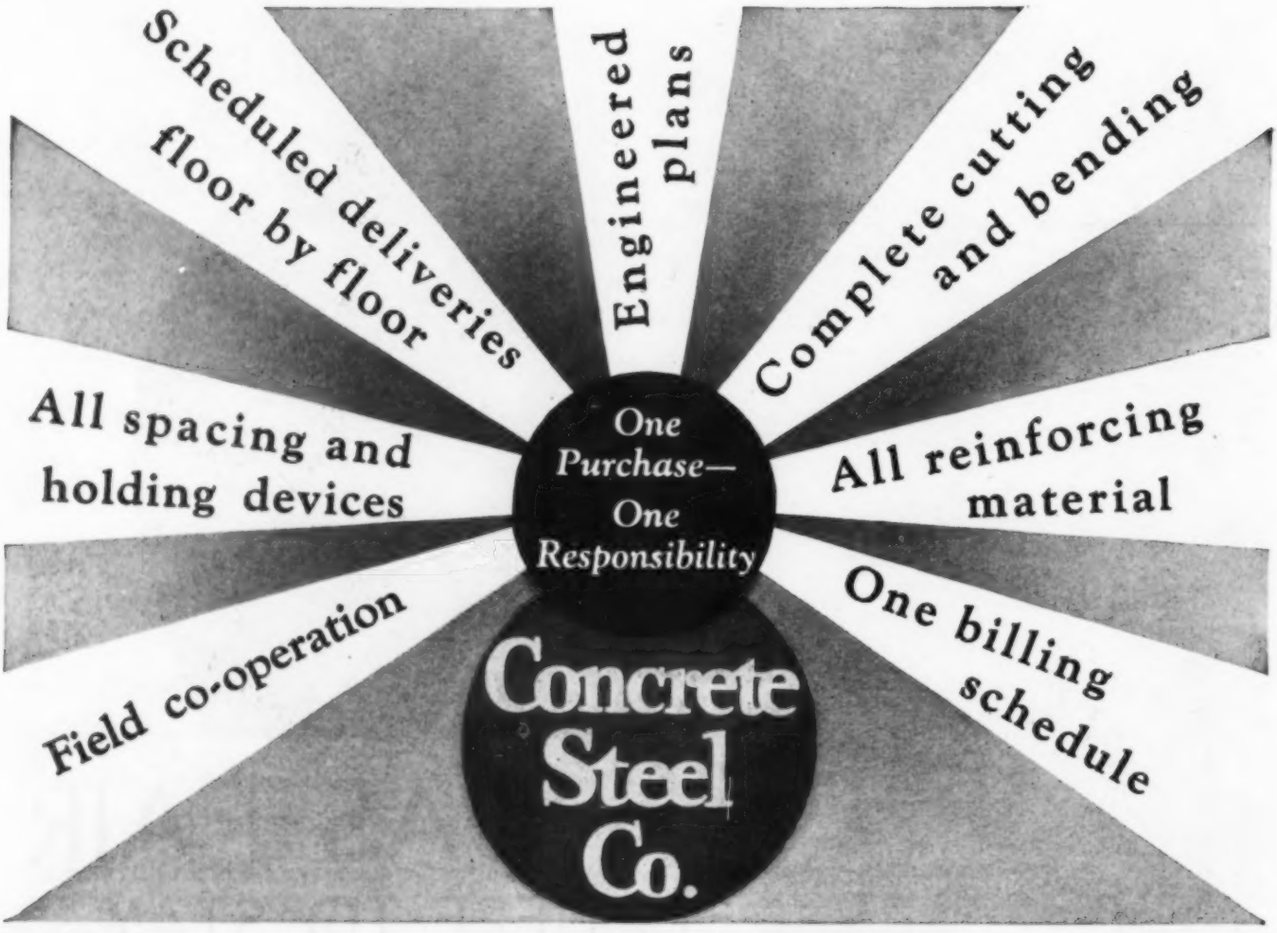
BUCYRUS ERIE

BUCYRUS-ERIE COMPANY, manufacturers of the only complete line — all sizes, types and powers. *Plants:* South Milwaukee, Wis., Erie, Pa., Evansville, Ind. *General Offices:* South Milwaukee, Wisconsin.



What our ONE PURCHASE RESPONSIBILITY plan means to contractors

Through its one purchase—one responsibility plan, the Concrete Steel Company furnishes the job with all necessary reinforcing material in a way that means time and labor saved for the contractor...The plan insures greater profits from each job. It saves the worry of getting materials to the job on time. It eliminates costly delays. It saves the time and labor usually spent in fabricating on the job.

Give the Concrete Steel Company "All-in-One" plan a trial. Let us figure with you on the reinforcement material for your next job.

Concrete Steel Co.

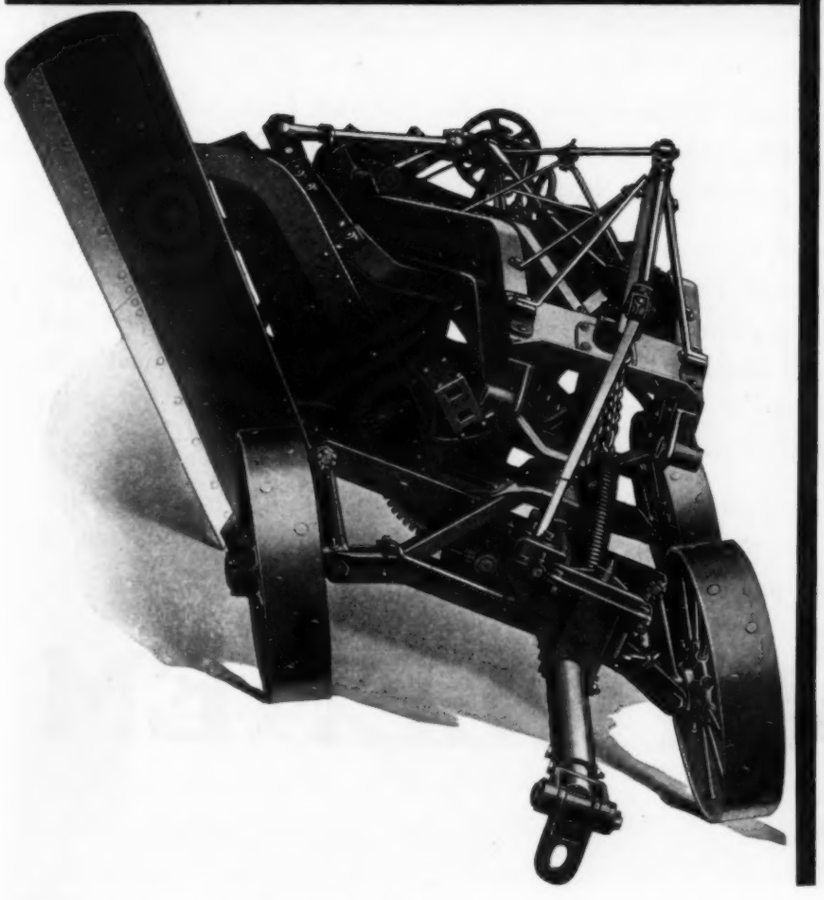
2 PARK AVENUE . . . NEW YORK CITY

Sales Offices and Warehouses in Principal Cities

Announcing the

"CATERPILLAR" SIXTY *Leaning Wheel* GRADER

Meeting Needs of Modern Roads



Wider grow the roads, deeper the ditches, better sloped the banks — Wider reaches the "Caterpillar" blade, deeper does it cut in the ditches, higher does it reach into the bank—

With these advantages comes the "Caterpillar" Sixty Leaning Wheel Grader.

Leaning Wheels.
3-Point Control to hold correct blade pitch advantage.
Ball and Roller Bearings on entire lift mechanism.
Bank Cutting Blade which cuts a 60 degree slope with a high reach of six feet six inches.
Compensating Spring Lift so mounted as to equalize tension on both ends of blade and exert uniform lifting force at any elevation of blade.
All Housed Gears Machine Cut.
Extensible Lift Links for greater reach.
Centralized Adjustment Controls.
60½-Inch One-Piece Structural Steel Circle.
Bronze Lift Gears, adjustable to six points of wear, running against machine-cut steel worm mounted on roller bearings.
One-Piece Carbon Steel Blade Beams riveted half way 'round the circle.
Four Vise-Like Screw Clamps that hold circle in their grip.
Nine-Inch Ship Channel Frame, weighing 28.6 pounds to the foot, reinforced.
42-Inch Lateral Side Shift.
Axle Spindles Drop Forged, heat-treated, chrome-nickel steel.
Tapered Roller Bearings in all wheels.
Tapered Cork Seals and Metal Guards to exclude dust from wheels.
Steel Wheels with Cast-In-Hub Spokes countersunk through tire.
Draft Direct to Blade . . . no draft applied to blade through frame.

Price

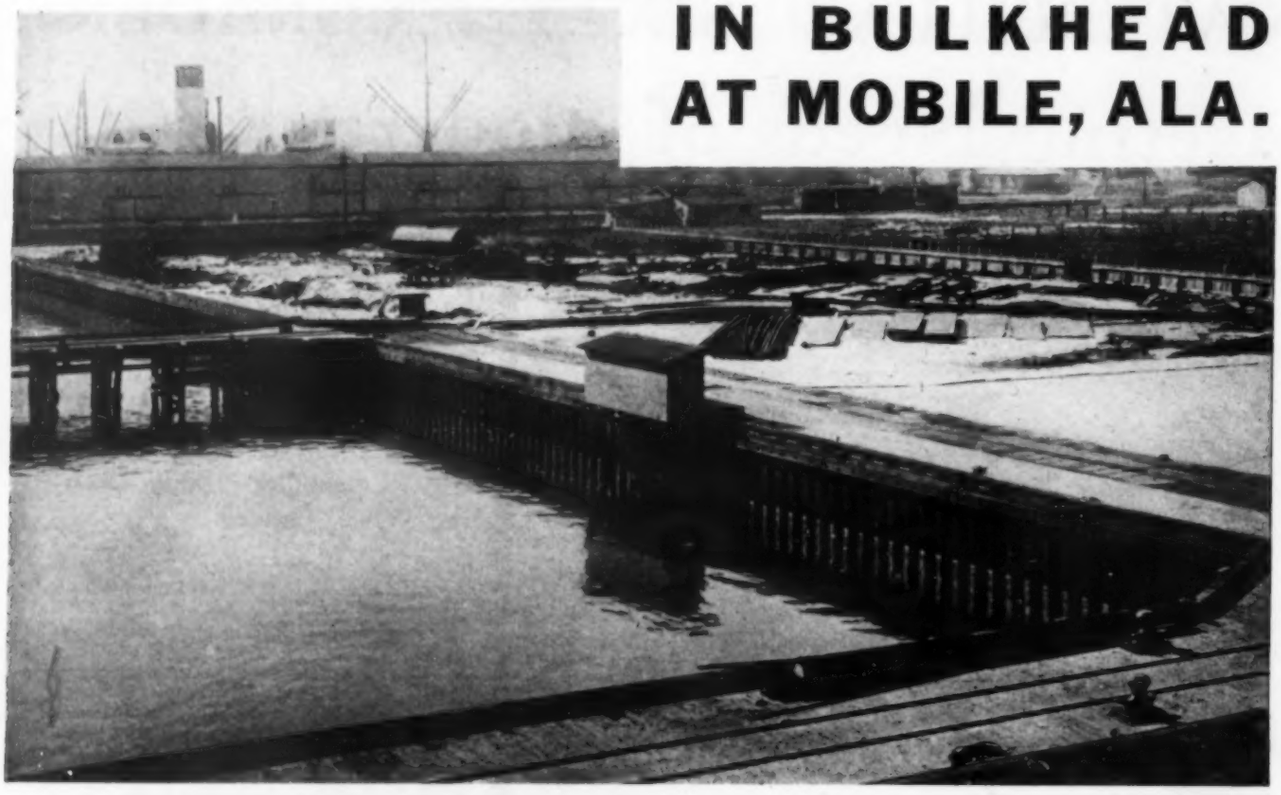
F. O. B. Minneapolis, Minnesota $1900

Caterpillar Tractor Co.

PEORIA, ILL. *and* SAN LEANDRO, CALIF., U.S.A.
Track-type Tractors : Combines : Road Machinery
(There is a "Caterpillar" Dealer Near You)

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR

LACKAWANNA
DEEP-ARCH PILING
IN BULKHEAD AT MOBILE, ALA.



This 500-foot bulkhead was constructed with Lackawanna 16 in. x 3/8 in. Deep-Arch Section D P 165, in 45-foot lengths. Depth of water at bulkhead, 20 feet.

Because of its high transverse strength and low weight per square foot of wall, Lackawanna Deep-Arch Piling is particularly suitable for bulkhead and dock-wall construction. The speed and ease with which it is handled, and its low cost as compared with other types of construction are advantages which have led to its extensive use in this kind of work.

Write for further information on Lackawanna Piling. Our engineering department will gladly cooperate with you and suggest the section most suitable for your purpose.

Frederic R. Harris, Inc.,
New York City
Consulting Engineers

Doullut and Ewin, Inc.,
New Orleans, La.
General Contractors

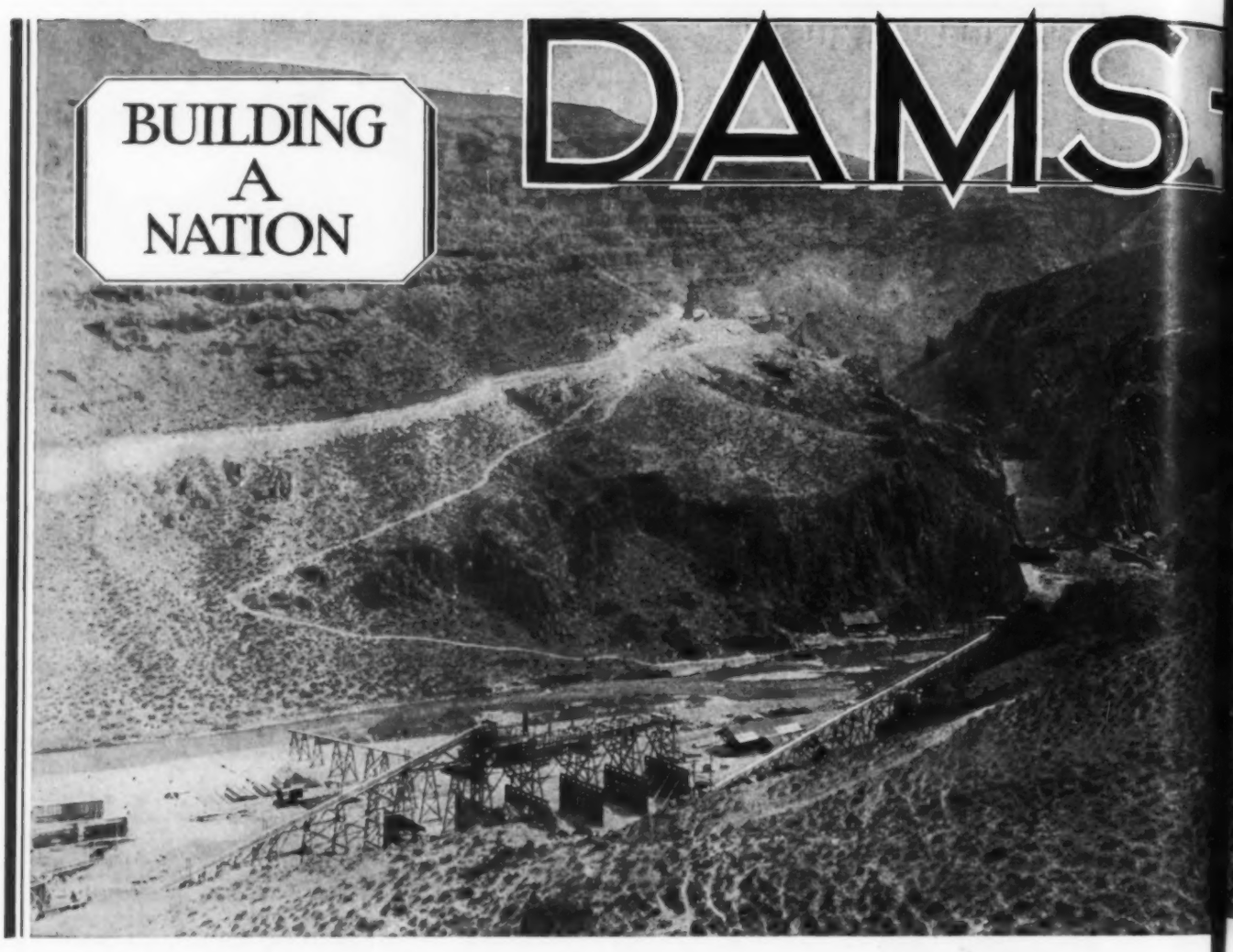
BETHLEHEM STEEL COMPANY
General Offices: **Bethlehem, Pa.**

District Offices:
New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.

Pacific Coast Distributor:
Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu.

Export Distributor:
Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM



THIRTY miles southwest of Nyssa, Oregon — in a remote canyon the U. S. Bureau of Reclamation is pouring 540,000 cubic yards of concrete in the path of Ol' Man Owyhee River.

Where before was a shiftless, unruly, often destructive river, will appear a placid, 13,000-acre reservoir of life-sustaining water for the fertilization of 125,000 acres of arid Oregon and Idaho lands.

Aiding the General Construction Company — contractor for the project — is G-E Motorized Power, dependably operating the crushers, screens, and mixers that prepare the aggregates; the compressors that force air into the rock drills; the great aërial tramway that brings material from

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

4 ACES
in the shovel field

A complete range of shovel capacities from 3/8 to 3/4 yard machines—ready at all times to meet your earth moving problems.

And it *is* a problem to use a large capacity machine when a smaller shovel will do the same work, with less moving and hand-trimming. BAY-CITY shovels are built by experienced manufacturers—built to meet YOUR requirements.

There are refinements and features of design and construction in BAY-CITY machines that give you fast swing, fast hoist and crowd and quick travel. ALL BAY-CITY shovels are convertible, easily controlled and economical. BAY-CITY shovels are at work everywhere and making good doing unusual jobs. Jobs done by heavier machines—jobs done by hand—all sorts of jobs where dependable, continuous service is demanded. They are money-makers.

Before buying your next shovel investigate the "BAY-CITY Family of Fast Workers"—Write now for catalogs and complete information.

BAY CITY SHOVELS, Inc.

New York Office—302 Broadway BAY CITY, MICH.

BAY-CITY SHOVELS

THE BAY-CITY FAMILY OF FAST WORKERS

Nothing like it

for Shallow Grading

THE powerful nibbling action of the Haiss pick-and-paddle digging and feeding device is like nothing else in excavating machinery. It has a lifting and loosening action which breaks up ground without plowing. One Haiss Excavator owned by a contractor in Cincinnati loaded

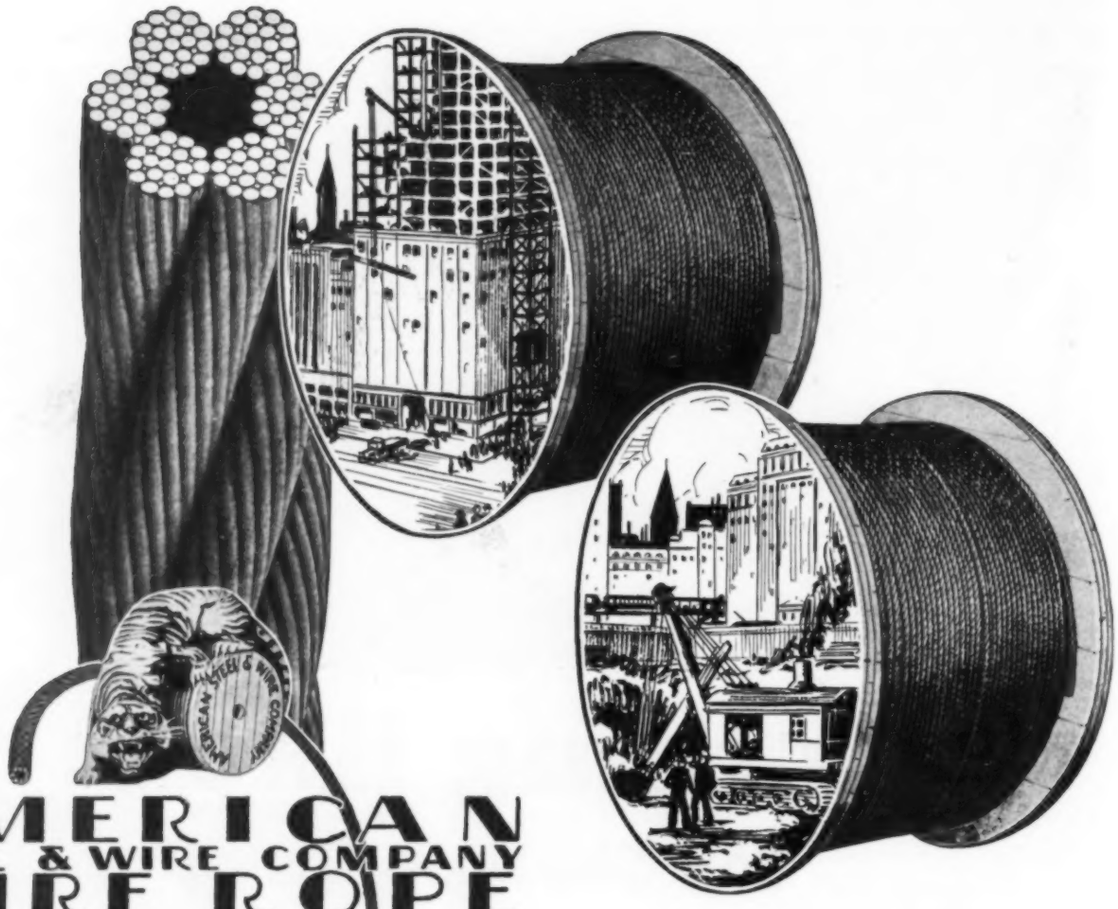
630 cu. yds. of spoil from street grading in an 8 hour working day

—handling a cut of 18 inches to 2 feet depth. Its season's work was 30,000 cu.yds. The continuous digging of an 8 ft. wide cut tears out yardage in shallow grading—faster than any of the older types of equipment on skimming passes. *Write for Performance Book 629 and see the working pictures and data.*

GEORGE HAISS MANUFACTURING CO., INC.
139th Street and Canal Place, New York, N. Y.
Representatives in Principal Cities

H-670

HAISS EXCAVATOR



AMERICAN STEEL & WIRE COMPANY WIRE ROPE

Largest wire rope manufacturers in the world

Its reliability is an established fact

American Wire Rope for the excavating machines and for the hoists. American Wire Rope for the elevators—and for any purpose where a reliable wire rope is required.

As a part of Construction equipment, as a part of Elevator Service, American Wire Rope has proved its advantages.

Each rope is manufactured under strict supervision, and inspected for quality and workmanship before it leaves the mill. This means much to your advantage as it results in increased service and lower operating costs. Specify American Wire Rope for your severe service requirements.

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City

PUNCHING action...

True *punching* action in a pile hammer means far more than pile pounding. It means the correct *application* of driving energy so that maximum penetration is secured with minimum waste of work and damage to piling.

The Warrington-Vulcan Pile Hammers have long been known as "the hammers with the punch"—embodying real *punching* action.

This means a heavy, low-velocity blow proportioned exactly right. Such a blow is far more effective than that of a hammer striking too light and swift a blow—a common fault of pile hammer design.

Freedom from mechanical failure, ease of operation, maximum footage, are other well-known qualities of Warrington-Vulcan Pile Hammers.

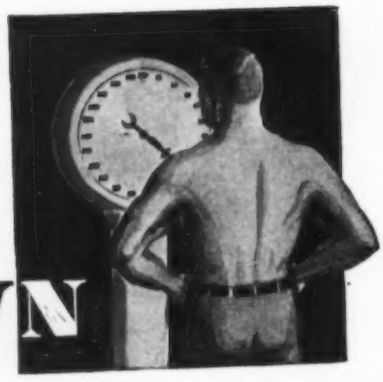
At the right is the Vulcan Pile EXTRACTOR, the money-saving machine for extracting all piling. This is the only actual pile pulling machine built exclusively for that purpose. It is moderate in first cost, always ready for instant service without rigging up and requires no "harness," no tedious adjustment such as is necessary in inverting a hammer for pulling.

Made in three sizes. Capable of pulling the longest, heaviest piling, and the most difficult to pull. Write for descriptive Bulletins.

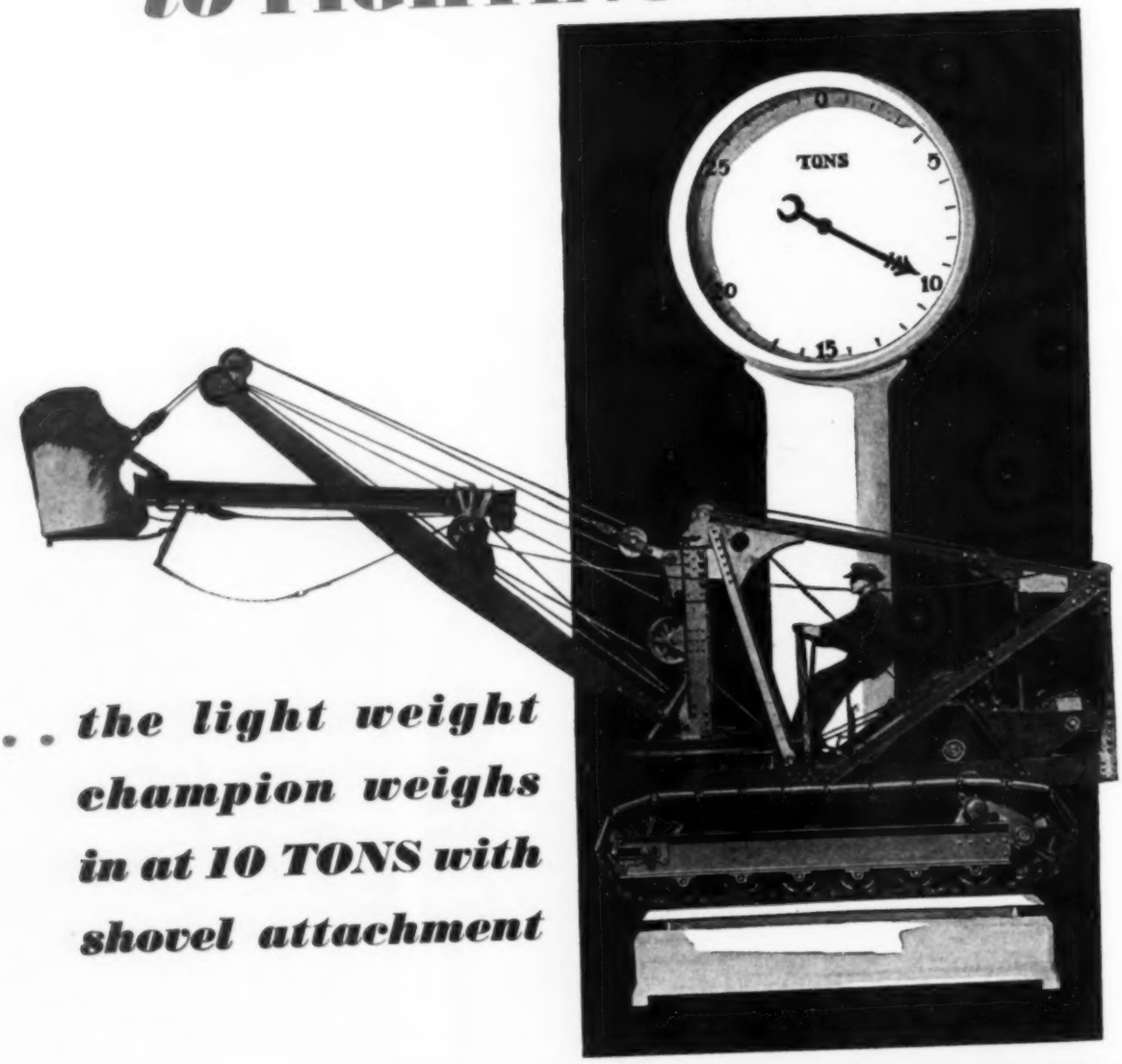
VULCAN IRON WORKS
327 No. Irving Avenue, Chicago, Illinois

Southern Representatives:
Woodward, Wight & Co., Ltd., 451 Howard Avenue, New Orleans, La.
Representatives for California, Nevada, Japan:
Harron, Rickard & McCone Co., 1600 Bryant Street, San Francisco, Calif.
Representatives for the State of Washington:
A. H. Cox & Co., Inc., 1757 First Avenue, S., Seattle, Washington

The Vulcan Extractor



DOWN *to* FIGHTING WEIGHT



. . . the light weight champion weighs in at 10 TONS with shovel attachment

BYERS

A WORTHY ADDITION TO

Up to finest standards of big-rig construction

EVERYTHING you could ask for in light, clean-up equipment is found in Byers Model 40. Quality construction . . . weight, 10 tons with attachment . . . wide working ranges . . . speed . . . economy of operation and maintenance . . . all the desirable features needed, but never before actually combined in one small machine, are now offered to you in Byers Model 40.

Twenty years of experience in manufacturing and selling over 3,000 light full-circle rigs, and other previous models have given Byers generous experience in utility, clean-up tool requirements. Model 40 has already proved itself a winner because the rich background of Byers experience provided specific knowledge about light machine requirements. Get the complete story about this machine today!

THE BYERS MACHINE CO., Ravenna, Ohio

BUILDERS *of 3/8 yd., 1/2 yd., 3/4 yd., 1 yd. and 1 1/4 yd. Machines*

SALES AND SERVICE THROUGHOUT THE COUNTRY

Easy to Operate

Simplified type power clutches
Independent one-man control of each operation from deck position

Wide Operating Ranges

25 ft. crane boom
Shovel digs 17 ft. 6 in. Dumps 12 ft.
Applicable to all booms and attachments

Extreme Mobility

Weight 10 tons with attachment
Bearing Pressure 6 lbs. per sq. inch
Two Travel Speeds
Steer either crawler

Quality Construction

Unit Casting Construction
3 1/2 in. dia. drum shaft
5 1/4 in. dia. propelling shaft
Oil worm operated boom hoist
Timken bearing mounted jackshaft and mast bottom
BYERS' famous direct power-saving drive
Independent reversible all-cable crowd

Accessible for Adjustment

All adjustments to machinery and motor accessible

Low Operating and Maintenance Costs

Large sheaves, long cable leads
Large 12 inch diameter drums
36 H.P. Motor consumes 1 to 1 1/2 gals. gas per hour

model 40

BYERS FULL CIRCLE LINE

STRUCTURAL STEEL CREATED THE SKYSCRAPER

STEEL REACHES INTO THE FUTURE

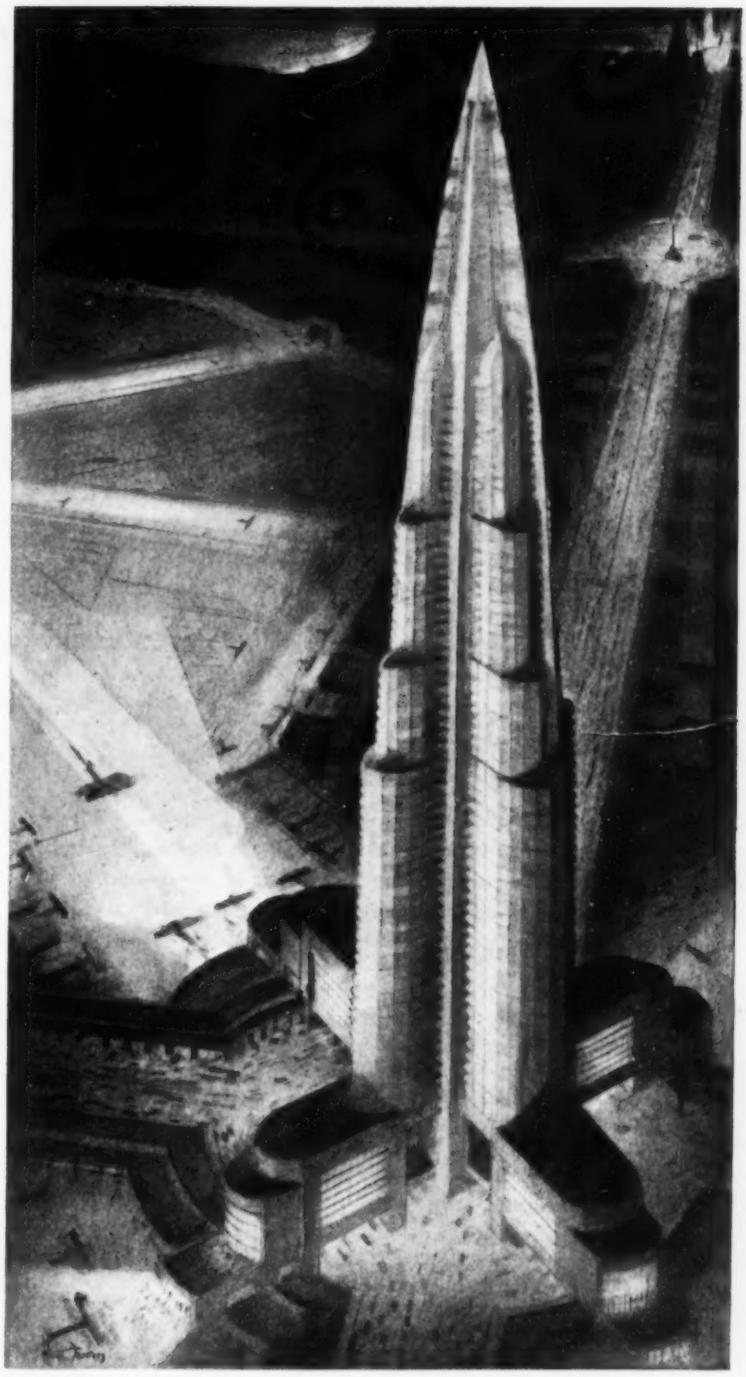
•

A MULTI-MOTORED metal plane sweeps skyward on its scheduled flight! . . . A metal spire is swiftly thrust to record heights—on time, as specified! . . . To be sure, the mighty frame of structural steel is firmly rooted in solid stone . . . yet, because they are extending man's horizons, both plane and skyscraper are kin.

Steel reaches into the future as no other fire-resistive material does or can . . . is ready with its full strength and adaptability, its great security and economy, for all tomorrow's wants. Meanwhile there is pressing need for steel construction in smaller buildings—in homes, apartment and mercantile houses, schools, industrial plants and small bridges.

Here, also, steel saves building time and material—provides more floor space with less weight, less bulk—secures quicker returns on investments and longer usefulness.

Before building anything find out what steel can do for you. The Institute serves as a clearing house for technical and economic information on structural steel, and offers full and free co-operation in the use of such data to architects, engineers and all others interested.



"AIRPORT OF THE FUTURE"—IMAGINATIVE DESIGN BY HUGH FERRISS. AN ENLARGEMENT, ON SPECIAL STOCK FOR FRAMING, WILL BE MAILED WITHOUT CHARGE TO ANY ARCHITECT, ENGINEER, OR BUSINESS EXECUTIVE.

The co-operative non-profit service organization of the structural steel industry of North America. Through its extensive test and research program, the Institute aims to establish the full facts regarding steel in relation to every type of construction. The Institute's many publications, covering every phase of steel construction, are available on request. Please address all inquiries to 200 Madison Avenue, New York City. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas and San Francisco.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY

TALK NUMBER EIGHT BY A PROMINENT DISTRIBUTOR

Mr. Palmer Leeper
Treasurer of
The Western Windmill
Company, Inc.
Sweetwater, Texas
says

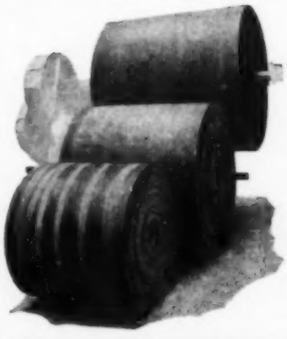
» » » "Will You Use Our Services *or* Pay Interest?

Above—The Western Windmill Company, Inc. of Sweetwater, Texas. This company's services are of a definite economic value to the prosperity of its business territory.

WE save the consumer investment and interest charges. At least, we do so for the ones who use us. Our purchasing power is as great as the largest user possesses, consequently, if used as a company warehouse we can and will eliminate the original investment with its consequent carrying charge.

We recommend Republic's Belting—Hose—Packing—Molded and Lathe Cut Goods."

The above statement is characteristic of those made by prominent distributors all over the country. It explains in part how the Industrial Supply Distributor, helping to solve the important problem of broad markets and economical distribution, upholds high quality, maintains fair prices and saves needless efforts on the part of both consumer and manufacturer.



Republic's Conveyor Belting line is complete, in that, Republic's experimental department has developed these labor savers for every known condition. Whether the material be hard or soft—hot or cold - light or heavy—some one of Republic's Belts will do the work economically.

THE
REPUBLIC RUBBER CO.
Youngstown
Ohio

REPUBLIC means the Best Mechanical Rubber Goods

Why An Owen Gets Bigger Bites

OWEN Bucket lips and teeth hit first when the open bucket drops, *no other part of the bucket touching the material.* Thus the total weight of the bucket is utilized to force the teeth and cutting edges of the jaws into the material. This feature also provides an advantage—not found in any other bucket—the use of the full open spread of the bucket before the closing power is applied.

Owen teeth are of heavy high carbon drop-forged steel with chisel point bevel and correct digging pitch—another reason for clean cut, deep bites. Write for an Owen Folder that explains 17 of these important reasons in detail.

THE OWEN BUCKET CO.
6023 Breakwater Avenue
Cleveland, Ohio

17 POINTS OF LEADERSHIP

1. One-piece steel cross-head.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. Long arm bolt bearings sealed from grit.
7. Lever type steel arm brackets.
8. Closing cable is protected against excessive wear.
9. Heavy shock-resisting renewable lips.
10. Cable clips eliminated.
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. Heavy duty high carbon drop-forged steel teeth.
17. **Lips or teeth points hit first.**

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

"Here, Lad—

I've just been talking to that man you sent in from Lincoln Electric Company.

He certainly is a crank on the subject of arc welding. How does he get that way?"

"Easy, Pop—

He's an *intimate* of my friend here, 'Arc Welding'.

Fact is every man in the Lincoln organization is a similar 'crank' and for very good reason.

During working hours everyone from the 'card please' boy at the front door to the welder bouncer on the shipping platform, all they *see* is arc welding.

All they *read* is matter on arc welding.

All they *study* is arc welding.

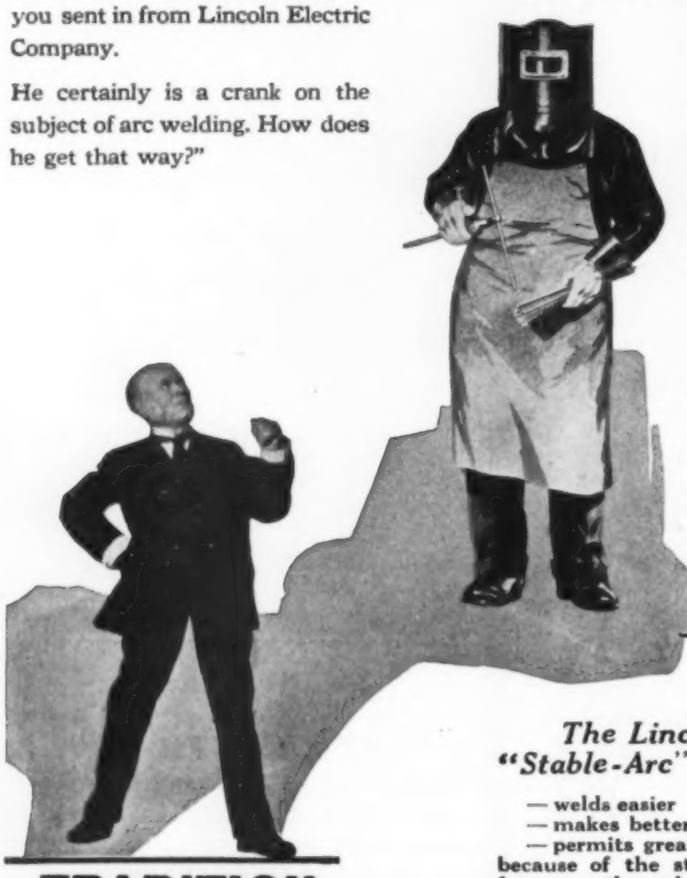
All they *hear* at company meetings or in business conduct is arc welding.

All they *teach* at the Lincoln school is arc welding.

When they *talk* shop it must be on arc welding because that's all that happens in the shop.

And because they're that kind of 'cranks' due to strict specialization, more is naturally expected of their welders than if their production was varied.

It's significant to note, Pop, that 87% of the statues in the world have been erected to men who were once called 'cranks' on specialized subjects."



TRADITION

PROGRESS

The Lincoln "Stable-Arc" Welder

— welds easier
— makes better welds
— permits greater output

because of the steady uniform arc throughout entire welding range, which is the result of:

- Variable voltage design
- Laminated magnetic circuit
- Separately-excited generator field
- Double control of welding heat
- All steel construction

No other welder has all these features.

The Lincoln Electric Co., Dept. No. 32-8, Cleveland, O.

"Stable-Arc"

W-152

LINCOLN WELDER

Photo to right shows 84" GOHI Corrugated Culvert as installed by the state of Nebraska. These photos appear on page 798 of the 1927-1928 report of the Secretary of Public Works of that state.

Before *and* After

Solving Drainage Problems in Nebraska *with*

Corrugated Culverts

GENUINE OPEN HEARTH IRON — GOHI — TRADE MARK — PURE IRON - COPPER ALLOY — REG. U.S. PAT. OFF.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

This large diameter GOHI Corrugated Culvert, installed by the State of Nebraska, is a practical demonstration of the economy and efficiency of this modern type.

Made of GOHI Genuine Open Hearth Iron, which is guaranteed 99.90% pure iron-copper alloy.

Thousands of culvert installations have established the extreme resistance of this metal to corrosion, its long life and low-cost-per-year service. GOHI Corrugated Culverts that have been in the ground for more than 20 years are still giving 100% drainage service.

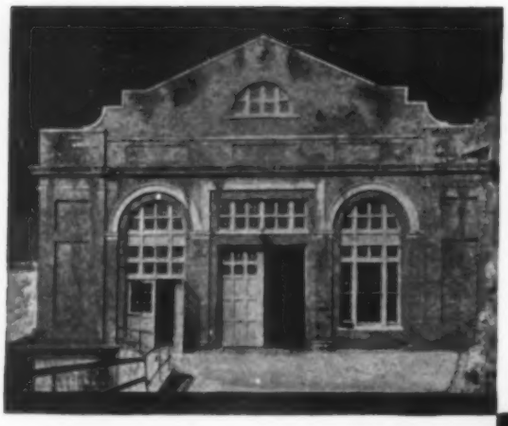
GOHI Corrugated Culverts are made in sizes to meet practical demands, from 8" to 96" and in thickness from 16 gauge to 8 gauge, depending on diameter. Made in any length in multiples of two feet.

All GOHI Corrugated Culverts have guaranteed 2-ounce pure spelter coating, scientifically applied.

Easy to handle . . . quick, low-cost installation. Once in the ground, the job's finished. No repairs, no upkeep costs. Write any of the GOHI fabricators below for technical service on any installation.

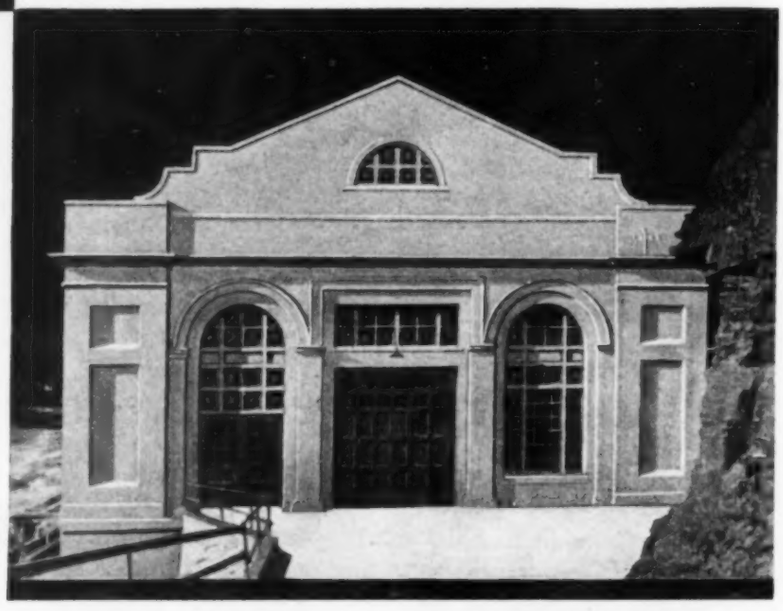
GOHI CULVERT MANUFACTURERS, INC., Newport, Ky.

Carolina Culvert Co. Salisbury, N. C.	Feenaughty Machinery Co. Portland, Oregon	The Pennsylvania Culvert Co. Philadelphia, Pa.	Tennison Brothers Oklahoma Cit, Okla.
Central Culvert Co. Ottumwa, Iowa	Lincoln Steel and Forge Co. St. Louis, Mo.	Roanoke Sales Corp. Roanoke, Va.	Capital City Culvert Co. Texarkana, Ark.
Denver Steel & Iron Works Co. Denver, Colo.	The Newport Culvert Co. Newport, Ky.	St. Paul Corrugating Co. St. Paul, Minn.	Tennison Brothers Madison, Wis.
A. N. Eaton, Metal Products Omaha, Nebr.			



Hydro-Electric Plant Restored and Preserved

An unusual remodeling job of reinforced Gunite, done with Atlas White portland cement



Before and after views of hydro-electric plant of Wisconsin Power & Light Co., Kilbourn, Wisc. Cement Gun Co., Inc., Allentown, Pa., contractor

This old brick building had become disfigured by water which leaked from the gutters, froze in winter and stained and eroded the surface of the building.

Patching would have made the building more unsightly. The problem to restore and preserve it was solved by using Atlas White portland cement for the new surface.

The brick was first sand-blasted. Then a body coat of 1¼ inches of Gunite, composed of Universal portland cement and torpedo sand, was shot on. After the Gunite had been leveled off, a finish coat of Atlas White portland cement and torpedo sand was put on to give the building the light color tint desired.

The attractive buff stippled surface makes the building look like new. And the durable, non-staining features of Atlas White portland cement makes this attractiveness permanent.

Atlas White portland cement has a wide range of usefulness on new buildings and on old buildings that need renewing.

29

Universal Atlas Cement Co.

Subsidiary of United States Steel Corporation

Concrete for Permanence

OFFICES IN: Chicago, New York, Philadelphia, Boston, Newark, Albany, Pittsburgh, Cleveland, Columbus, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Omaha, Oklahoma City, Birmingham and Waco.

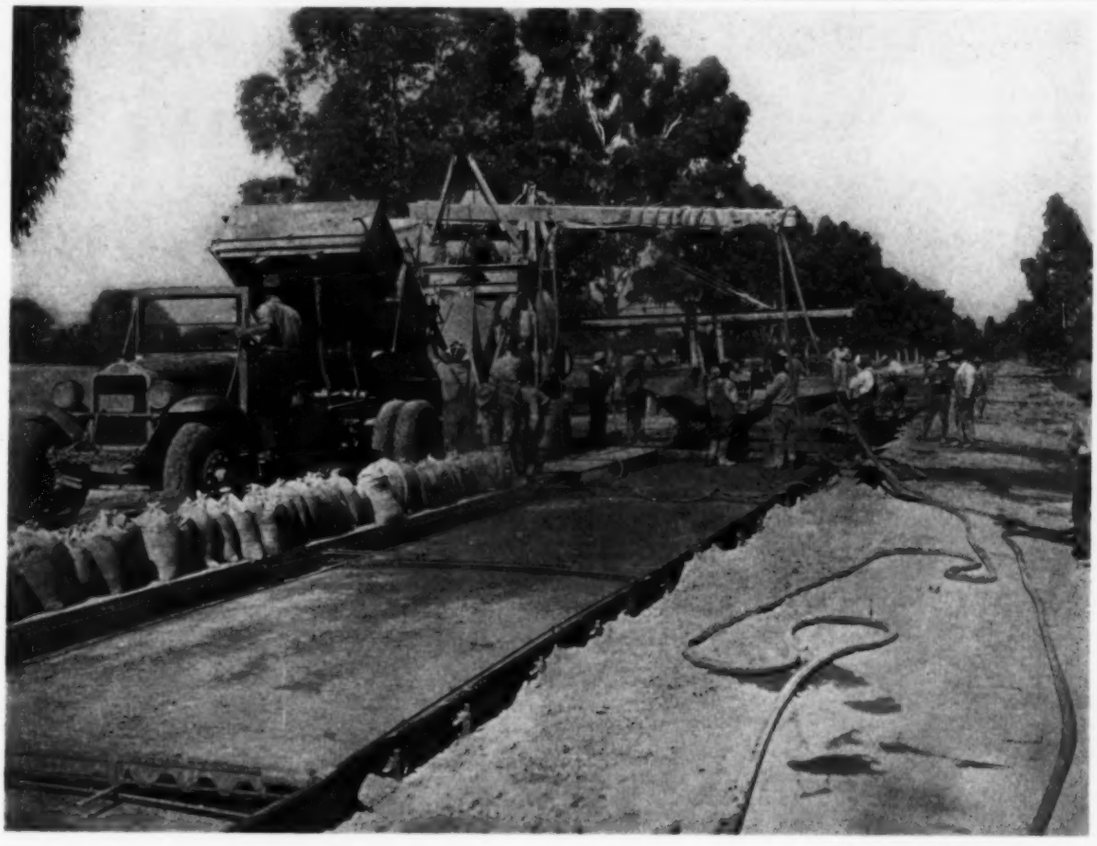
CM 8-30

Construction Methods

A McGraw-Hill Publication—Established 1919

ROBERT K. TOMLIN, *Editor*

VOLUME 12 NEW YORK, AUGUST, 1930 NUMBER 8



BATCH TRUCKS dump aggregates directly into skip of paver. Cement is piled ahead of paver and emptied by hand as needed.

HIGH SPEED *on a Paving Job*

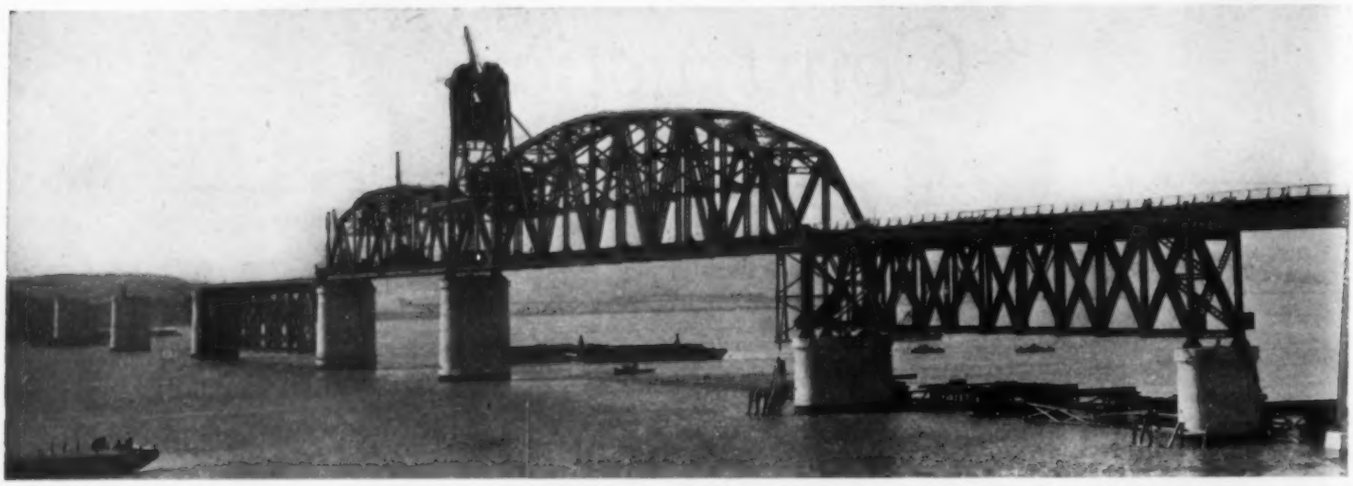
EFFICIENT organization of a paving crew consisting of a foreman and 21 men on a state highway job between Sacramento and Auburn, Calif., enabled the contractors, the Frederickson & Watson Construction Co. and Frederickson Bros., of Stockton, to lay 1,877 lin.ft. of 9-6-9-in. concrete pavement 10 ft. wide in an 8-hour day and 17,210 ft. in a 10-day period.

The contract called for the construction of about 8.7 miles of 20- and 30-ft. pavement in 10-ft. strips. The mix used was approximately 1:1.8:3.8, the average strength of the concrete at 28 days being 4,500 lb. The slab was reinforced along the edges with ½-in. bars. Expansion joints were placed every 60-ft.

Sand and stone were hauled 7 miles by truck and loaded into a three-compartment, 400-ton aggregate bunker near the center of the job from which paving operations in both directions were started. Trucks, carrying three 1-yd. batches of aggregates proportioned by automatic weighing hoppers at the bunker, deposited their loads directly into the skip of the 27-E Foote paver. Sack cement was hauled and set up in a continuous line ahead of the paver and emptied by hand. The paver was regulated to turn out a 1-cu.yd. batch of concrete in 60 sec.

Water was supplied by two wells located at half-way points between the bunker and the limits of the job. From these wells 4 miles of pipe was laid along the route with connections at various points for supplying the paver. Two Ord finishing machines followed the paver.

Charles Frederickson was in direct charge of the work for the contractors, with W. E. Marshall as superintendent on the job. C. A. Potter was resident engineer, C. H. Whitmore, division engineer, and C. S. Pope, construction engineer for the California highway department.

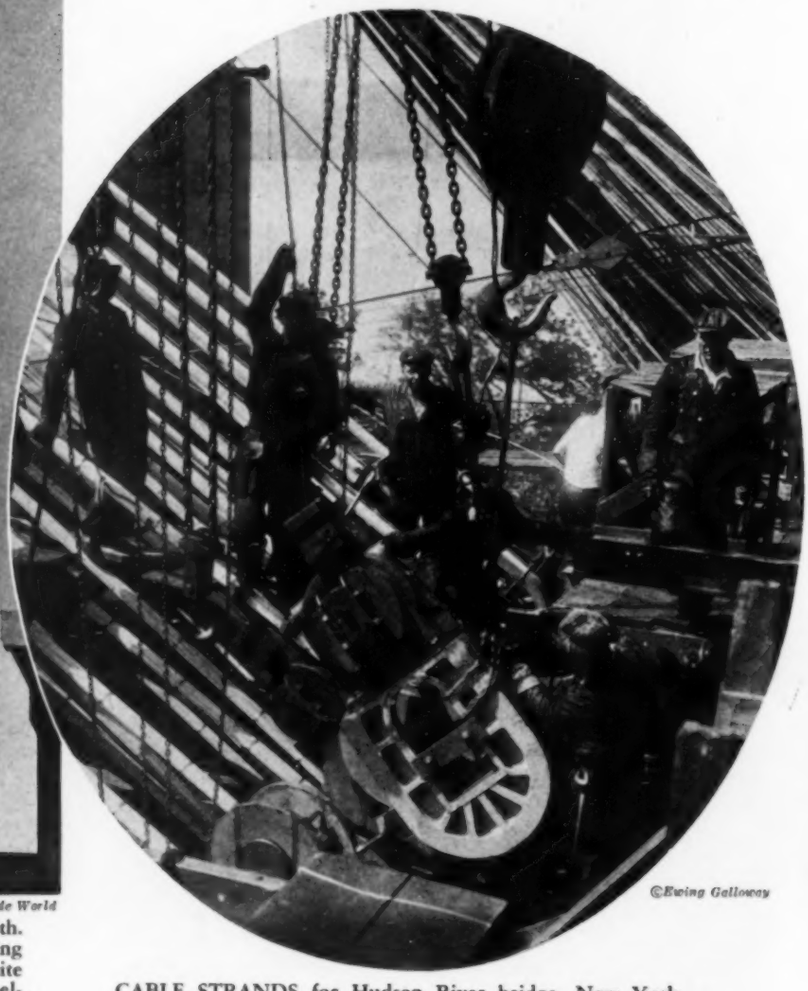


NEARING COMPLETION. Steel superstructure of Southern Pacific Railway's $12,000,000 bridge is extended more than a mile across Suisun Bay, San Francisco, by American Bridge Co. Concrete piers were built by Siems, Helmers & Schaffner, Inc. Hugh structure, when finished next November, will expedite car movement by replacing an old ferry.

This Month's "News Reel"

©Wide World

85 STORIES HIGH. Former Governor Alfred E. Smith, of New York, displays model of Empire State Building now under construction by Starrett Bros. & Eken on site of old Waldorf-Astoria Hotel, New York City. Steel-frame structure will extend to height of 1,045 ft. with tower reaching upward an additional 205 ft.

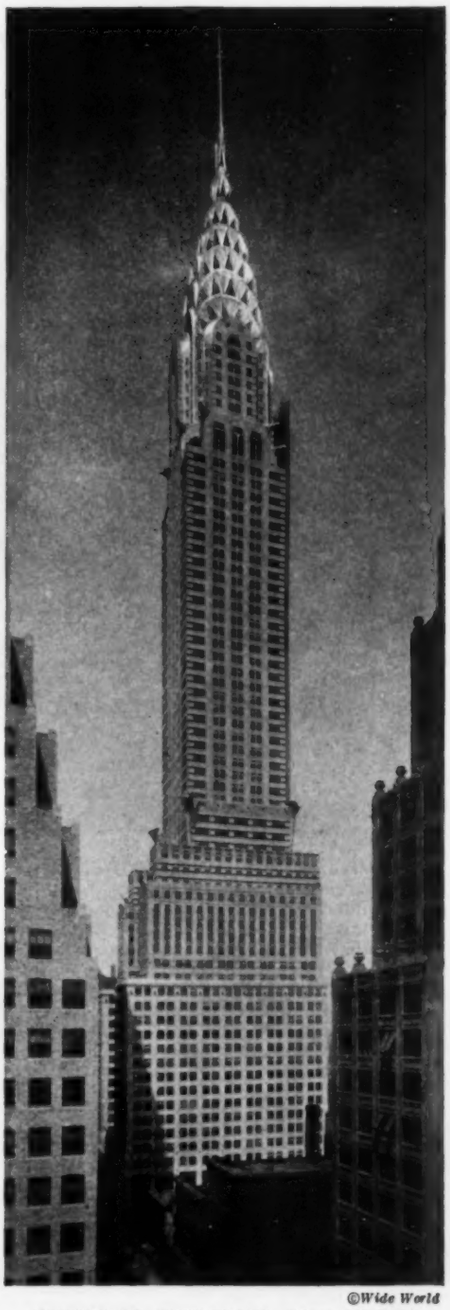


©Ewing Galloway

CABLE STRANDS for Hudson River bridge, New York, which will have suspension span of 3,500 ft., involve more than 28,000 tons of wire. Each of four main cables being installed by John A. Roebling's Sons Co., two on either side of bridge, contains 26,474 parallel wires.

ON OWYHEE DAM for U. S. Bureau of Reclamation in Oregon, General Construction Co. has installed 500-hp. screening and mixing plant with capacity of 1,000 cu.yd. per 8-hour shift, and 575-hp., 25-ton cableway with span of 1,300 ft. Structure will require 525,000 cu.yd. of concrete.

HIGHEST OF ITS TYPE *(right)*. Rodriquez dam under construction for Mexican Government irrigation project near Tijuana is 250 ft. high above foundations, tallest Ambursen dam ever built. Crest length is 2,200 ft.



©Wide World

CHRYSLER BUILDING, New York, is world's tallest completed building with height of 1,044 ft. Structure, containing 78 stories, was built by Fred T. Ley & Co., Inc.

©Fairchild Aerial Surveys

A PRIZE WINNER. Mt. Hope bridge, erected between Bristol and Portsmouth, R. I., by McClintic-Marshall Co. from designs by Robinson & Steinman, consulting engineers, New York, has received award by American Institute of Steel Construction as most beautiful long span bridge built last year.

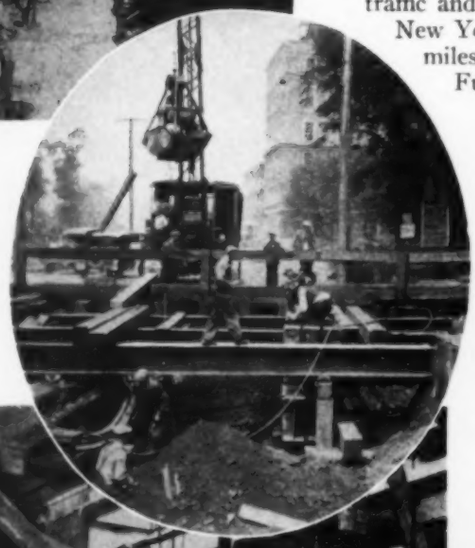
Building New York's Subways—I

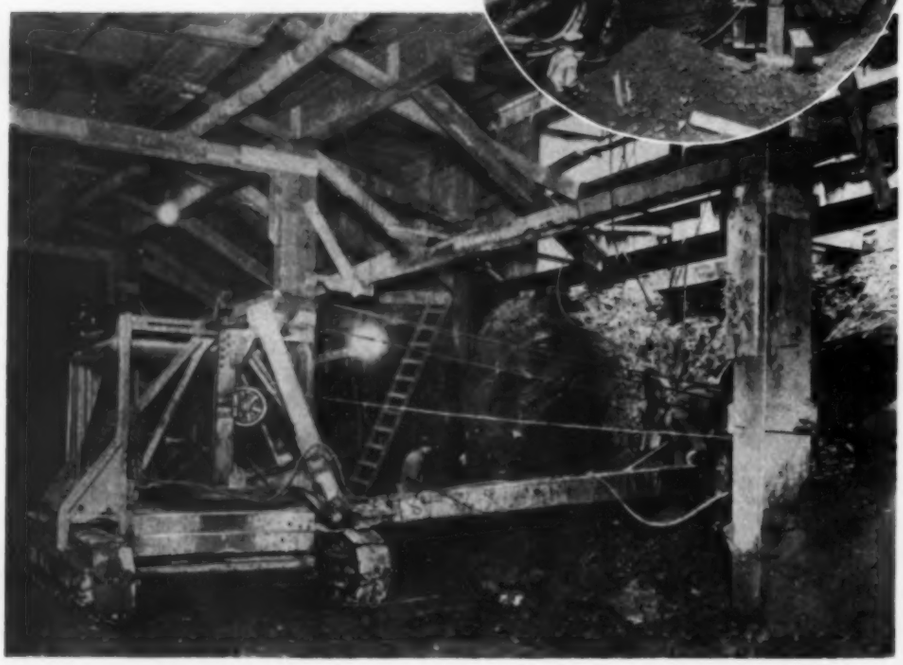
STEEL BEAMS
Form Basis of Modern
STREET DECKING

A PROJECT as extensive and involved as the building of New York City's third great subway system presents difficult problems in location, design, and construction. Engineers and contractors are compelled by the many difficulties which they face to use almost the entire catalog of modern methods, materials, and machines. Only by so doing can they make construction possible, keep the costs within reason, and prevent disorders of the city's traffic and public utilities.

New York's third subway system comprises 59 miles of route and 180 miles of single track. Fully equipped, its cost to the city will be

NO INTERRUPTION OF TRAFFIC. Operations of subway builder must not interfere with normal course of business in city. Decking usually is installed in half width of street at a time. Crane and shovel make shallow cut. Decking follows them closely. Traffic is diverted to completed decking before rest of street surface is opened. Rosoff Subway Construction Co., Inc., contractor.





ONE TYPE OF DECKING has longitudinal girders resting on posts and supporting transverse beams which carry joists of plank roadway. Corson Construction Corporation places transverse beams on upper flange of longitudinals. End of transverse beam rests on bank behind sheeting. Skimmer scoops are much used for cleaning up berm.

FIRST OPERATION *(left)* is excavating of cut to depth of 4 to 6 ft. and placing of decking for one half of street. Longitudinal steel beams are blocked up from bottom of cut. TRANSVERSE BEAMS *(below)* are spliced and bolted at connection between two halves of decking. George H. Flinn Corporation uses transverse beams carried by upper flanges of longitudinals. Bolted connections are most common type used in decking.

First of a Series on Construction of New York City's Third Underground Rapid Transit System

$650,000,000. Cost of general construction, performed by one contractor for each section of route, averages about $10,000,000 a mile. Sections vary in length; but the average is about ½ mile.

The typical subway structure is the steel-bent box type, built on one or two levels to accommodate a total of from one to ten tracks. River tunnels are shield-driven under compressed air and are lined with cast-iron plates covered by concrete. A unique section of the system has four land tunnels driven by the shield method under free air and lined with concrete blocks. Other sections require tunneling in rock.

Construction conditions vary greatly from section to section and on the sections themselves. In the commercial districts, the underpinning of heavy buildings, or the employment of other means to prevent settlement, is an important feature of the subway construction. Many sections have the problem of underpinning elevated railway columns. Soils vary from hard rock and dry earth to disintegrated rock and wet sand or clay.

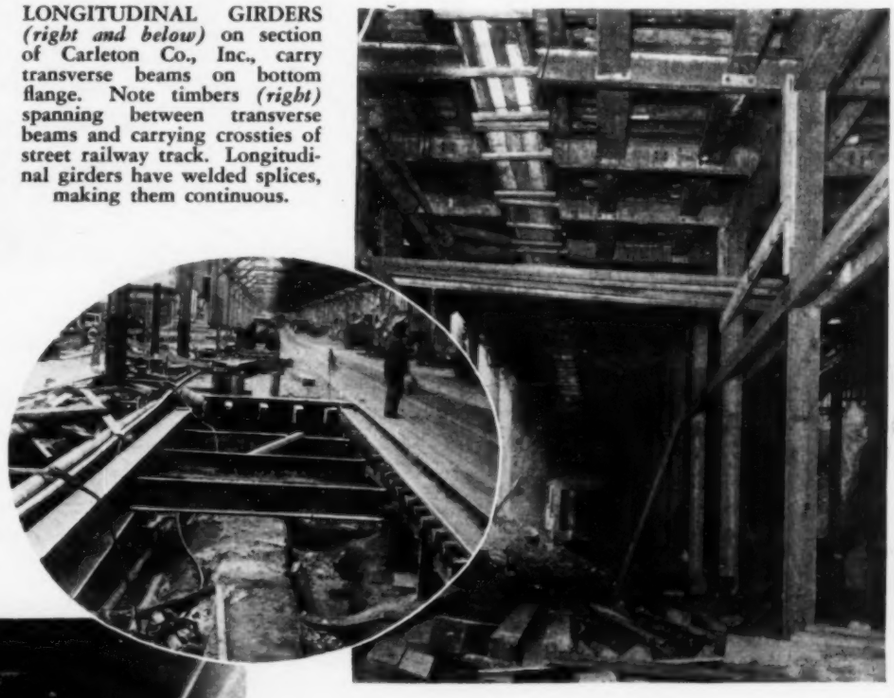
Complete charge of all operations involved in the planning and building of the subway, except the financing, rests with the Board of Transportation of the City of New York, of which Robert Ridgway is chief engineer. Construction is under the direct supervision of John R. Slattery, deputy chief engineer.

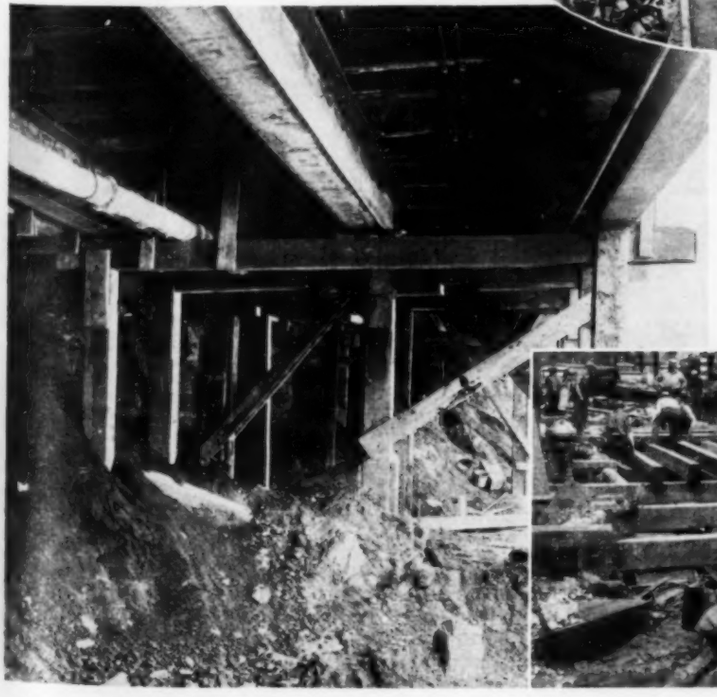
A prime requirement imposed by the Board of Transportation upon all contractors is that construction operations shall not disturb traffic and public services. As the usual location of the subways is between the building lines of city streets, the decking is of great importance.

Decking is designed to meet the live load requirement fixed by general specifications at 200 lb. per square foot and to permit excavating by the desired

SQUARE TIMBERING will support decking on this street. Rosoff Subway Construction Co., Inc., prefers to use steel longitudinal beams under planks. Excavation of deep two-track trench in fine wet sand on this section is to be handled through hatches in deck.

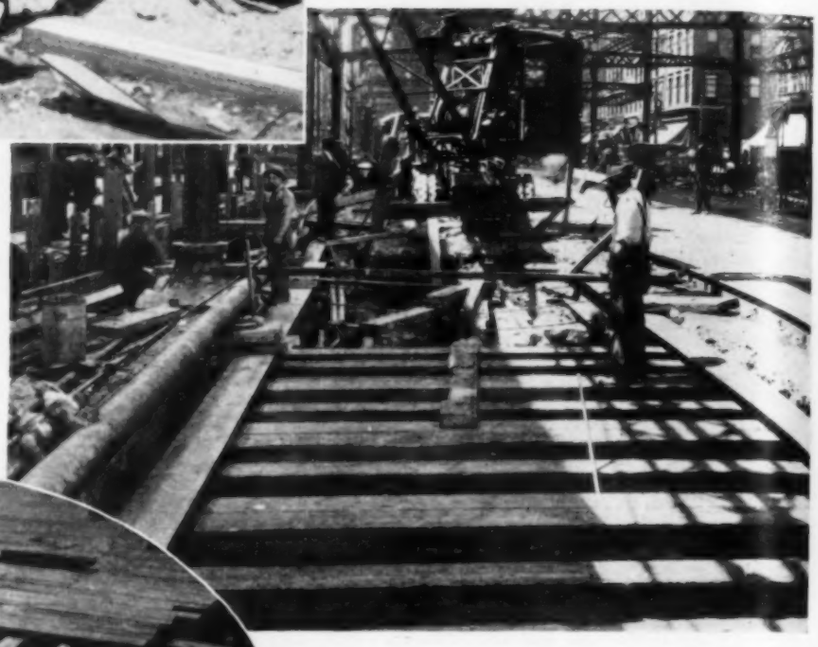
LONGITUDINAL GIRDERS *(right and below)* on section of Carleton Co., Inc., carry transverse beams on bottom flange. Note timbers *(right)* spanning between transverse beams and carrying crossties of street railway track. Longitudinal girders have welded splices, making them continuous.



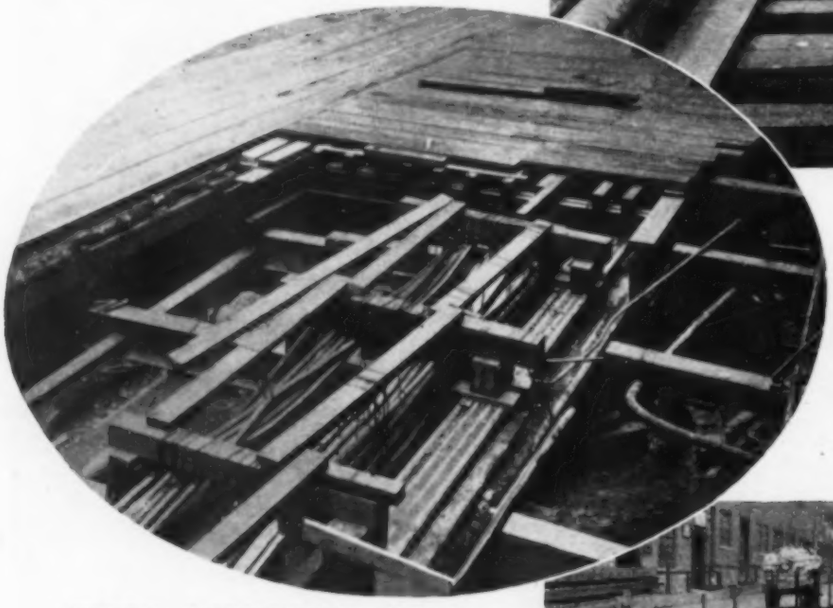


STEEL LONGITUDINAL BEAMS *(left and below)* in decking designs of Rosoff Subway Construction Co., Inc., carry wood transverse beams. Wood cap *(left)* on row of posts supports longitudinal girders. Tie rods and spreaders *(below)* hold longitudinals in alignment.

WOOD TRANSVERSE BEAMS *(below)* are carried on lower flange of longitudinal girders in decking system employed by Heyman & Goodman Co., Inc. Installation of decking proceeds immediately behind excavation of first cut.



HEAVY DECKING of 12x12-in. hardwood timbers rests directly on longitudinal girders blocked up from bottom of first cut for half of subway width. Del Balso Construction Corporation finds heavy decking economical because of low maintenance and high salvage value.



PRESENCE OF UTILITY DUCTS *(left)* forces modification of decking system. Longitudinal beams are blocked up from transverse beams, leaving space for ducts between lower transverse beams and upper transverse beams carried on bottom flanges of longitudinals. Note stirrup for suspending lower transverse beam from bottom flange of longitudinal while transverse beam is unsupported by posts. Rosoff Subway Construction Co., Inc., Contractor.

STURDY CONSTRUCTION *(below)* characterizes decking system of Atwell-Gustin-Morris, Inc., in which transverse girders on four-post towers support closely-spaced longitudinals. Heavy 12x 12-in. decking on longitudinals makes lasting roadway.

TRANSVERSE BEAMS carry longitudinals, which in turn support transverse floor beams on bottom flanges. Posts and bank support transverse beams. La Rocca Construction Corporation, contractor.

method. When excavation is handled through hatches in the deck, the contractor can support the decking by the old method of square timbering.

In square timbering, posts are set approximately 10 ft. apart in two directions and are braced by horizontal struts about 10 ft. apart vertically. Formerly, the decking on this type of timbering was carried by wood beams; today the practice is to use steel beams.

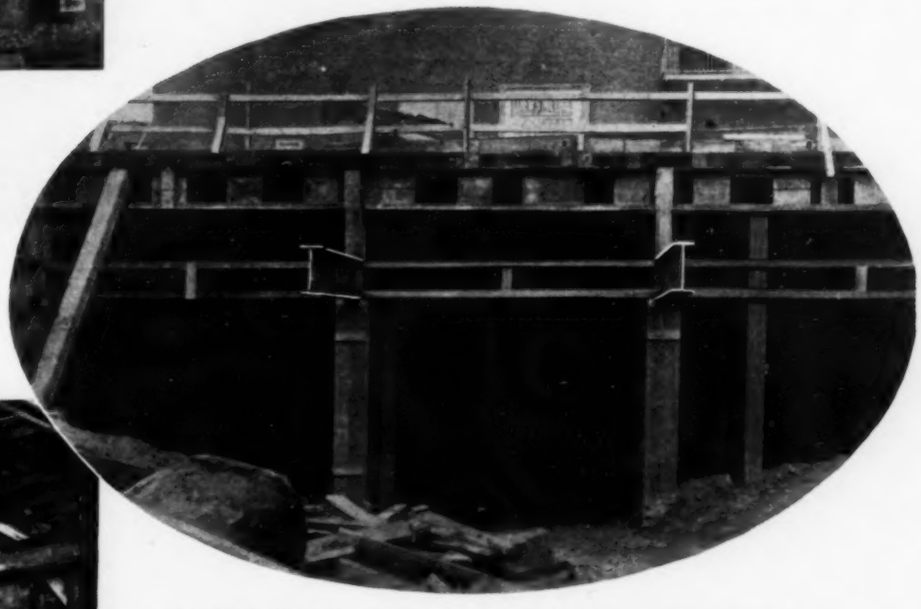
When power shovels do the excavating and loading into trucks,

TRANSVERSE TIMBERS, *(right)* suspended from longitudinal girders to be posted from below, carry joists which give intermediate support to 5-in. decking laid across longitudinals. Joists are blocked up from transverse timbers. Arthur McMullen Co., contractor.

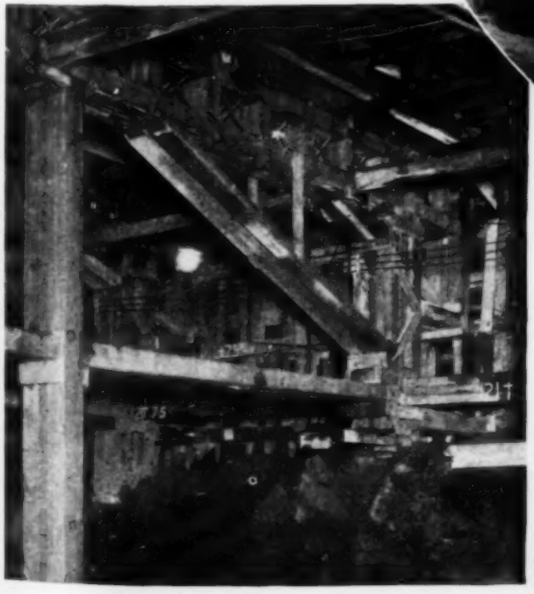
large working space is required, and the beams carrying the decking must bridge long spans at the face of the cut. Modern decking designs use structural steel for this purpose.

The first operation of subway construction, after adjoining and intersecting structures have been underpinned, is to make a surface cut 4 to 6 ft. deep in the street and install decking. This operation is carried on in sections, a good portion of the street width always being clear to carry traffic. Decking follows closely behind the excavating of the first cut.

STIRRUPS made up of steel angles and plates, hung from bottom flange of longitudinal girder, support transverse beams at times when it is necessary to remove posts from beneath transverse beams. Vertical legs of stirrup are fastened by bolts to Z plates which are bolted to web of longitudinal girder. Heyman & Goodman Co., Inc., contractor.



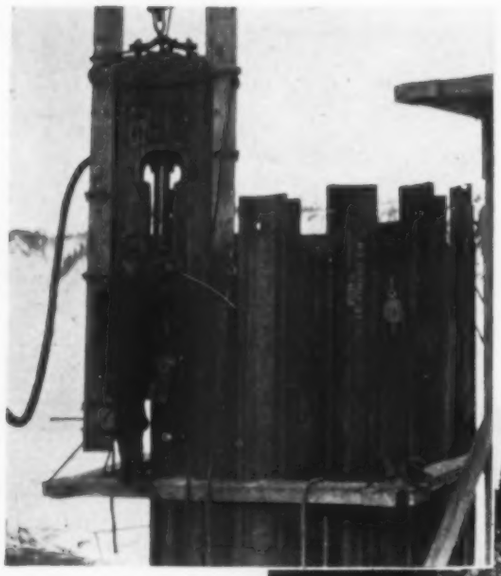
DISCONTINUOUS-WEB GIRDER, blocked up from transverse beams, is used by Del Balso Construction Corporation to carry 12x12-in. decking. This girder, fabricated from angles and plates, has high capacity in comparison with its weight and provides many openings for pipes, ducts, timber braces, and ropes. Note bracing between transverse beams to prevent overturning.



BOLTED TIMBER TRUSSES and discontinuous web girders carry decking for Frederick L. Cranford—Charles H. Locher, Inc.

OXYACETYLENE TORCH *(left)* burns holes for bolted connection between discontinuous web girder and I-beam at street intersection. Torches are commonly used for cutting matched bolt holes.

[NEXT MONTH: Another pictorial article on New York's subways.]

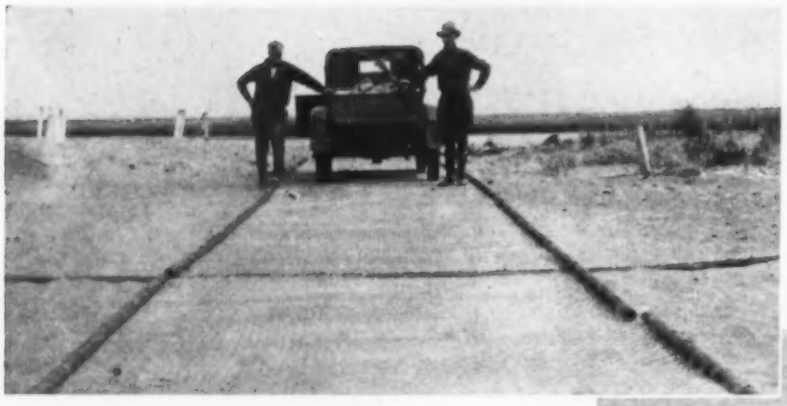


DRIVING SHEET PILING for bridge foundation across Nizina River. This type of work is almost always done in winter because of ease of movement over ice and because of possible summer floods.

DYNAMITE *(right)* is used to remove snow slides and to clear roads of snow. This method is found to be cheaper than any other yet devised.

LOCAL MATERIAL *(left)* went into the construction of this foot bridge which spans a river in this rugged section.

ALASKA—*A Challenge*



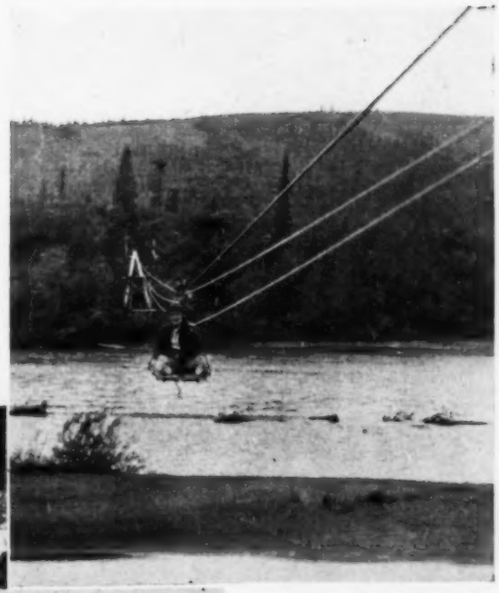
WIRE MESH FOR ROAD SURFACING carries traffic over soft sand and where ice conditions are bad. It consists of 8-ft. strips of No. 9 wire, woven in a 2-in. mesh and galvanized. Ends of strips are anchored by wrapping them around 2-in. iron pipes. Sides are tied to same kind of pipe and anchored every 8 ft. to stakes 15 ft. distant.

CONDITIONS of topography and climate make road construction in Alaska a slow and expensive process. After a road has been cleared, grubbed and graded, it requires three to four years for the subsoil to thaw and become stabilized. Gravel for road surfacing is generally available. In many places difficult and expensive to grade and drain, corduroy of scrub timber is used.

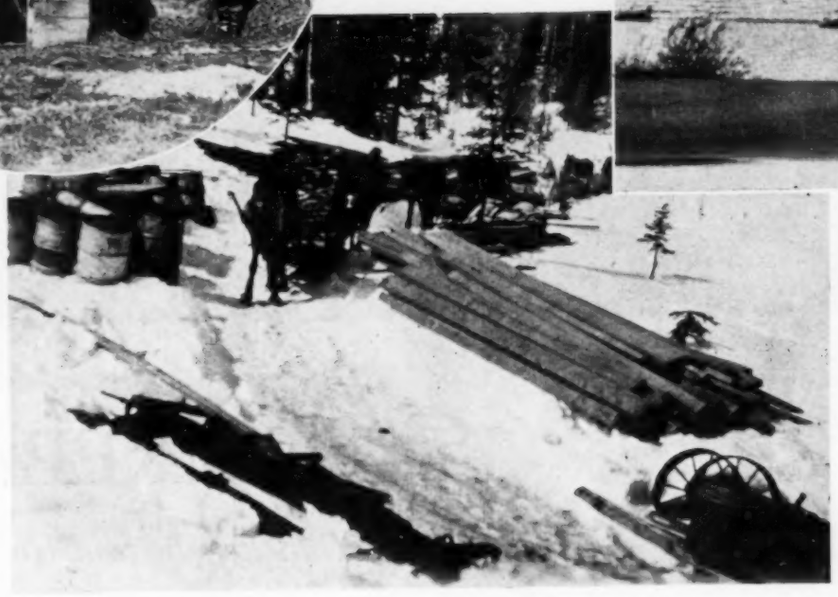
The Alaska Road Commission, under the direction of Major Malcolm Elliott, president, has charge of

ROCK-FILLED TIMBER CRIBS *(right)* are necessary on almost all of Alaska's glacier streams to protect pile substructure of bridges.

PRIMITIVE SHELTER CABIN *(left)* erected along routes of travel to provide overnight shelter and protection from storms.



CABLE TRAMWAY *(above)* is one method of crossing streams in Alaska. It is cheaper to build and maintain than a bridge and just as satisfactory on foot trails.



FREIGHTING FOR CONSTRUCTION *(right)* is done when snow is on ground as cost is lower and movement of materials is easier.

to the Roadbuilder

construction and maintenance of highways, sled roads, trails, bridges, airplane landing fields and shelter cabins. The accompanying photographs, supplied by the Commission, present a cross-section of its various activities and give an idea of the difficulties which are typical of construction in Alaska.

Due to the scarcity of other means of transportation, there has been a rapid development in aviation. The Commission had completed 54 landing fields up to 1930, with 10 under construction and 3 in prospect.

AIRPLANE, as newest method of Alaskan transportation, now makes a 4-hour trip out of what was once a 2-months' journey during the winter season.

SEPPALA USING HIS DOG TEAM *(left)* on the Nome-Shelton tramway on the Seward Peninsula, a 74-mile narrow-gage railroad maintained by the Alaska Road Commission. Gasoline locomotives and horses also draw flat cars, light speeders and passenger cars over this route.

130,000-CU.YD. SLIP occurred midway in downstream face of dam, venting one side of water-filled segregation pool in which core of dam was being puddled.

BREAK REPAIRED

Gap Left by Slide in 11,000,000-Yd.

NEW earth has been placed to close the gap created last February when a slide removed a comparatively small portion of the 11,000,000-cu.yd. embankment forming the Saluda dam in South Carolina. Starting at the top, midway in the downstream slope of the huge earth fill, the slide took out 130,000 cu.yd. of material and vented one side of the water-filled segregation pool maintained to produce a puddled core along the center line of the structure, as described in the August, 1929 issue of *Construction Methods*. Repairs to the break in the dam by the Arundel Corporation, of Baltimore, operating as subcontractor to W. S. Barstow & Co., Inc., consumed 70 days and mark the completion of the main feature of the hydro-electric development for the Lexington Water Power Corporation, subsidiary of the General Gas & Electric Corporation, the latter a unit of the Associated Gas & Electric Co.

When the slide occurred, the upstream and downstream embankments enclosing the pool were approximately 19 ft. below the ultimate crest of the dam. To avoid delays in the progress of the job, a change then was made in the previous general plan of operations, so far as the placing of the core in the middle 2,350 ft. of the 7,800-ft. length of the embankment was con-

REHANDLING CORE MATERIAL from dump-car fill approximately to place with power shovels and cranes. Caterpillar tractors levelled off material with bulldozers and road rollers compacted thin layers.

REPAIR WORK progressing on slip in downstream face of dam. Long-boom draglines rehandled to place material delivered by dump-car trains.

AT SALUDA DAM

Embankment Closed by New Earth Fill

cerned. Immediately following the slip in the downstream face two fills were made crosswise of the segregation pool. One of these was placed 2,800 ft. from the north end, and the other 2,650 ft. from the south end of the dam. Water then was pumped into these two pools and the embankment carried up at the ends by the methods described in the August, 1929 article. This left a section 2,350 ft. long about midway in the dam in which the core was placed dry.

The first step in repairing the break in the downstream slope was to get a toehold at the bottom of the slide. A high concrete retaining wall at the downstream ends of five large waterways under the dam gave a base on which to start operations. Men with hand shovels first shaped up the rough and eroded face of the break so that long-boom draglines could be worked down the steep slope toward the base. Meantime, a timber trestle was built out from each side of the gap about half way up the side of the slope. Material was then dumped from cars on these trestles, to within range of the dragline buckets. Dump-wagons and trucks were used to a limited extent at the start of the repairs to reach areas beyond the range of the cranes.

The fill in the break was brought up in as nearly uniform layers as pos-

CORE MATERIAL compacted in thin layers by rolling thoroughly after being spread dry with tractors equipped with bulldozers.

SPILLWAY PIERS AND ABUTMENTS carry immense gates beyond one end of 7,800-ft. long dam.

sible in this manner. After each layer was placed it was leveled off by Caterpillar tractors equipped with bulldozers. The tractors also served to compact the material effectively.

The fill closing the gap made by the slide was brought up as fast as possible to above the height of the portion of the core of the dam remaining undisturbed. As a matter of fact, very little of the core went out when the slide occurred. All of it that was exposed by the slide showed remarkable density and uniformity. Work, therefore, could be pushed right ahead in regular sequence at both ends of the dam, where the segregation pools had been restored. On the 2,350-ft. section midway in the dam where the remainder of the core was to be placed in the dry the embankment on the upstream side of the break was carried right up with the progress on the rest of the fill.

To keep the core in the middle section approximately at the height of that in the two end sections material was brought in cars operating on tracks laid on the embankment on the upstream side. These cars were side-dumped to within range of power shovels and cranes operating on top of the core as it progressed in height. The shovels and cranes took the material from the face of the fill and deposited it approximately in place in the core. Caterpillar tractors equipped with bulldozers then spread the material out in layers about 8 in. deep. Road rollers next compacted these layers thoroughly. The character of the material was so satisfactory that very little sprinkling was considered necessary.

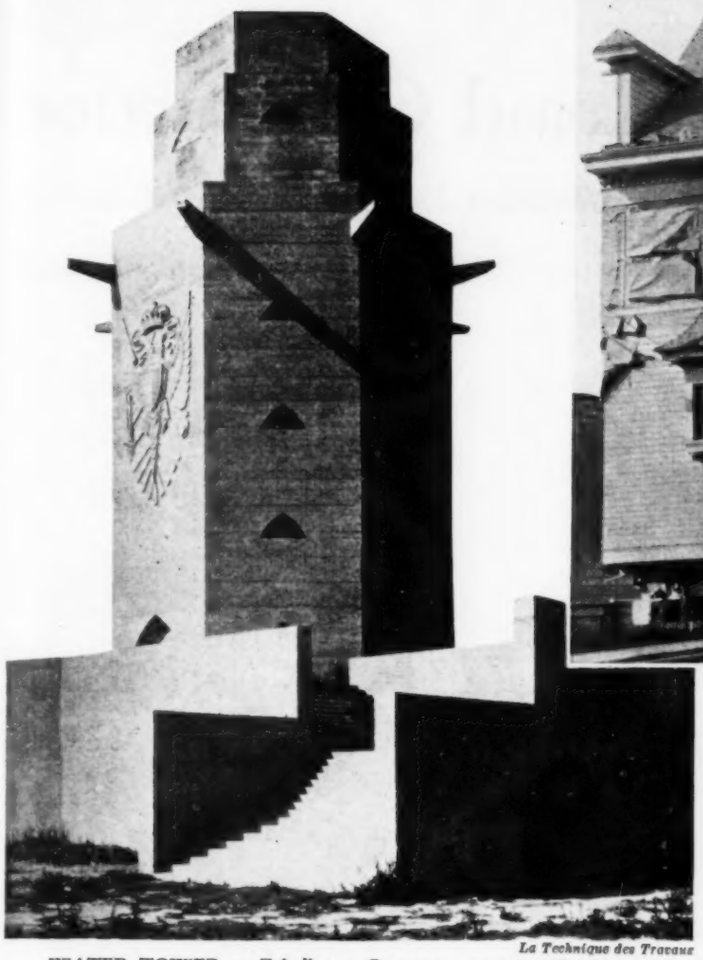
Working in this manner the downstream crest of the fill was brought up to the level of the upstream fill within 70 days after the slide occurred. Then the core material for the middle section of the dam was delivered in trains operating on tracks on both fills and placed as outlined in the previous paragraph. It was thus possible to carry the rest of the portion of the core built in the dry up in uniform layers of the desired depth. At the same time, the trackage could be arranged so as to permit uninterrupted progress on the two ends of the dam where the core was still being placed through the segregation pools.

Actual work on the hydro-electric development, of which the Saluda dam is the main feature, was started in September, 1927. In less than 34 months more than 11,000,000 cu.yd of pay material was placed in the dam, an average exceeding 325,000 cu.yd per month.

During this period the Arundel Corporation also did the following work on the project: execavated 275,286 cu.yd. of earth and 34,150 cu.yd. of rock; poured 74,214 cu.yd. of concrete, including 325 tons of reinforcing steel and 1,200 tons of structural steel in intake towers, and placed 75,000 cu.yd. of riprap on the upstream face of the dam.

N. D. Urquhart was in charge of all work for W. S. Barstow & Co., Inc. The Barstow organization engaged Murray & Flood as engineers, with A. R. Wellwood as resident engineer for the latter firm. A. S. Crane was retained by the Lexington Water Power Co. as consulting engineer. H. O. Firor was in charge for the Arundel Corporation.

SEGREGATION POOL at south end of dam approaching completion following slide in downstream face of dam. Reservoir 57 ft. below maximum flow line.



La Technique des Travaux

WATER TOWER at Friedberg, Germany, constructed of concrete with special surface finish, has appearance of massive monument. It contains both an upper and a lower reservoir.

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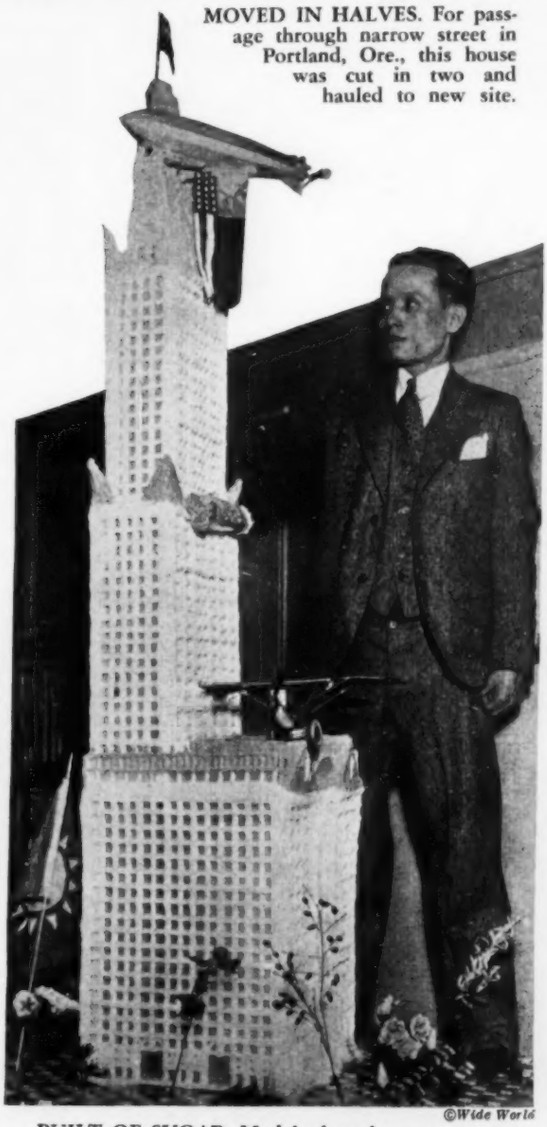
MOVED IN HALVES. For passage through narrow street in Portland, Ore., this house was cut in two and hauled to new site.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction

A BIG BERTHA in the cement industry. Gun-like in appearance, this huge revolving kiln, 343 ft. long, and 11¼ ft. in diameter, produces clinker for the Portland Midwest Co. at Laramie, Wyo.



©Wide World

BUILT OF SUGAR. Model of modern structure, 60 stories high, is produced by T. B. Wu, 25-year-old Chinese student, using composition in which powdered sugar is the chief ingredient.

Railroad Construction

Builders Perform Difficult Grading

38 Miles of Relocated Branch

D. W. FRASER *(left)*, superintendent, Sturm & Dillard Co., and ROSCOE PORTER, resident engineer Norfolk & Western Railway Co.

By VINCENT B. SMITH
Assistant Editor,
Construction Methods

A STANDARD-GAGE railroad 38.5 miles long, traversing three states, soon will replace the existing narrow-gage Big Sandy & Cumberland Railroad between Devon, W. Va., on the Norfolk & Western main line, and Grundy, county seat of Buchanan County, Va. Between the states of Virginia and West Virginia the line crosses Pike County, Ky. The Norfolk & Western Railway Co. has purchased the narrow-gage railroad and is managing construction of the standard-gage line. The map on p. 45 shows the location of the work.

This article describes only the work from Devon to Hurley, including 2.5 miles of heavy grading to widen the main line, the wye bridge, the tunnel, and 11 miles of open grading on Knox Creek. Next month's article will discuss the 26½ miles of construction between Hurley, Grundy and the state line.

Construction of the railroad is made much more difficult by the rugged nature of the terrain which it traverses. Existence of the narrow-gage line greatly simplified the problem of importing equipment and materials, but it also complicated construction of certain overlapping portions of the new line.

Contractors—On the portion of the work being considered in this article the contractors are W. W. Boxley & Co., of Roanoke, Va., and the Sturm & Dillard Co., of Columbus, Ohio. W. W. Boxley & Co., who hold the contract covering the widening of the main line for the addition of four storage tracks, the building of the wye bridge across the Tug River, and the construction of the tunnel and approaches, have assigned to J. V. Boxley & Co. the actual performance of the work on their contract section.

Grading, bridges and culverts from the tunnel to Hurley are included in the contract of the Sturm & Dillard Co., which is performing all the work except the grading for 3½ miles below Hurley. This part of the contract has been sublet to the W. H. Anderson Construction Co., of Asheville, N. C.

Main-Line Work—The purpose of the main line work was to provide a four-track yard with storage facilities for freight moving to and from the Big Sandy & Cumberland Railroad. Operations involved in widening the grade to provide space for the four additional tracks were very difficult and hazardous, as the work consisted of cutting back the faces of high cliffs which just cleared the existing westbound track.

Excavation for the 2½ miles amounted to 315,000 yd., of which 236,000 yd. was solid rock. One heavy cut was 144 ft. high on the cut line and 160 ft. high on the slope line. This cut contained 121,000 yd. of material, 75 per cent of which was rock. Both jackhammer drills and well drills were used in putting down holes for blasting the faces of the cliffs.

TUNNEL MUCKER is brought into north portal over completed west leg of wye bridge. Compressor station and concrete plant are on far side of river.

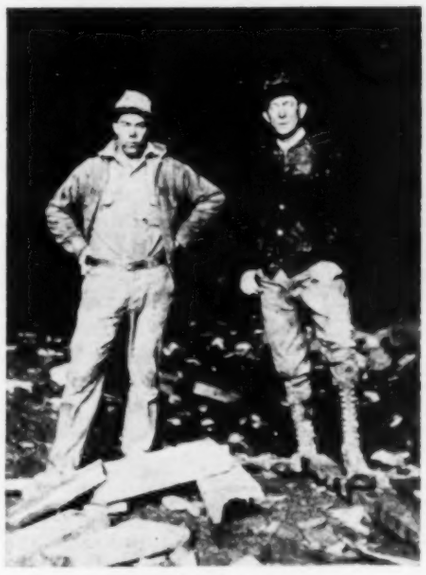
RAILROAD SHOVEL, air-operated, loads tunnel bench muck into 4-yd. dump cars.

On the cut nearest the existing main line track drilling was done with jackhammers. Well drills were used in all the other cuts, holes being spaced about 15 ft. apart. Six to eight holes were loaded with 40 per cent duPont extra-strength Red Cross dynamite and were shot at one time. A 2½-yd. Marion railroad-type steam shovel and an Osgood crawler-mounted 1¼-yd. steam shovel loaded the blasted rock into three work trains comprising a total of 35 standard-gage, air-dump Kilbourne & Jacobs, Western, and Koppel cars: sixteen of 30-yd., two of 20-yd., and seventeen of 16-yd. size. Cars were moved to the dump by N. & W. locomotives and train crews.

The Ingersoll-Rand jackhammers used in the main line grading work

in Mountain Country—IV

Bridge and Tunnel Work in Broad-Gaging Line of Norfolk & Western Railway



W. P. GRADY *(left)*, tunnel foreman, and J. J. BOXLEY, superintendent, J. V. Boxley & Co.

were operated by air from a central compressor station at the wye bridge.

Plant at Wye Bridge—To drive the compressors and other machines needed in tunnel, bridge and grading work, the contractors installed a power plant consisting of two 150-hp. marine boilers at the north end of the wye bridge. These boilers supplied steam to drive two Ingersoll-Rand air compressors having a total capacity of about 2,300 cu.ft. per min., two 25-kw. G.E. generators, and a Smith 1-yd. tilting mixer in the central concrete plant. The mixing plant produced the 2,800 cu.yd. of concrete for the bridge masonry and the concrete for the tunnel lining.

Construction of Wye Bridge—In addition to the south abutment, which carries both legs of the wye bridge, each leg has a north abutment and three piers, extending to a height of 30.75 ft. above low water. The average depth of solid rock foundation is 16.75 ft. below low water. Each bridge has four 90-ft. deck plate-girder spans.

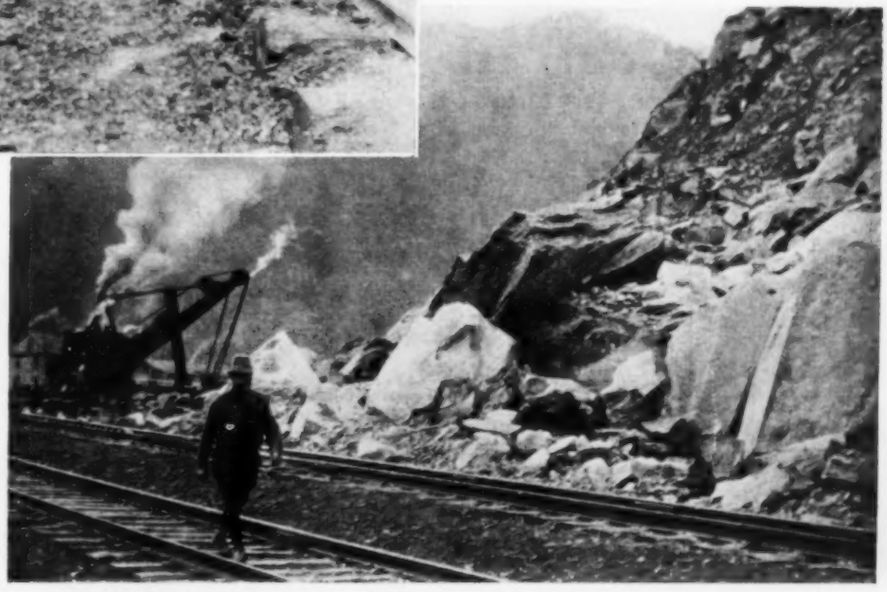
For the construction of the bridge piers the contractors drove wood sheet-pile cofferdams around all footings, before excavating to bedrock. To distribute concrete from the central mixing plant, trestles were erected to carry buggy runways from the plant to the piers.

Tunnel Construction—To start the tunnel, a crown heading was driven from both ends. The bench was taken out entirely from the Tug River end. Rock encountered has been a uniformly hard sandstone, except for a 4-ft. coal seam in the heading. This seam was uncovered at wall-plate grade on the Tug River end. Rising faster than the grade of the tunnel, the seam came out at the Knox Creek portal above roof grade, making it necessary to take out the coal through the entire length of the tunnel and to timber the heading.

Driving Heading—Two Ingersoll-Rand water Leyner drifter drills on column mountings were used in each heading. In addition, one drill was kept in reserve at each portal. A 3-in. line from the compressor plant carried air across the river to the north portal and over the mountain to the south portal. Heading crews loaded the broken rock into low 1½-yd. flat-bottom, side-dump cars of special design made to order by J. R. Hoe & Sons, Middleboro, Ky. Mules moved the cars.

Taking Out Bench—After the crown heading had been driven, the contractors bratticed up the south portal and installed a 6-ft. mine fan at that end to induce a draft through the heading.

KEEPING NARROW-GAGE LINE IN OPERATION, especially where two grades overlap, causes much shifting of narrow-gage track. Contractor lays third rail to use narrow gage for standard-gage equipment.



WIDENING MAIN LINE to make four-track storage yard. Operation requires blasting of cliffs adjacent to westbound track.

Bench operations began at the north end.

The bench was shot in two lifts, a top lift 10 ft. deep and a bottom lift 16 ft. deep. Seven Ingersoll-Rand jackhammer drills were operated on the bench. The two lifts were shot simultaneously. Each round pulled 6 ft.

A Marion air-operated railroad-type steam shovel with a 1½-yd. dipper loaded the bench muck into 4-yd. Continental dump cars spotted on a track beside the shovel. Four narrow-gage, coke-burning steam dinkeys, two Vulcan 18-ton, a Baldwin 20-ton, and a Davenport 20-ton handled five-car trains both inside and outside the tunnel. The ventilating system kept the main tunnel free from coke fumes, but the escaping smoke caused some discomfort to the drillers on the bench.

Construction on Knox Creek—The rugged topography, the narrowness of the valley, the presence of the narrow-gage line to be kept in operation, and the necessity of building eleven bridges and five culverts in 11 miles made construction along Knox Creek complicated and difficult. Differences in elevation of the narrow-gage and standard-gage lines, confined in the narrow valley resulted in the overlapping of the two grades at many places and forced the contractor to shift the narrow-gage track frequently. The shifting of this track often presented a difficult task.

The contractor's general plan of operation was to drill and shoot all the cuts ahead of the shovels and, also, to complete all masonry structures ahead of the grading in order to avoid delays at bridges and culverts.

MAST-HOIST PLANT pours piers and abutments of bridge across Knox Creek. Concrete for seven other bridges and four culverts is hauled from ½-yd. mixer at this plant.

Masonry Construction—All concrete structures from Lower Elk Creek to Hurley were built by the Sturm & Dillard Co. To construct the eight bridges, containing 9,634 yd., and the four culverts, containing 2,083 yd., in the 7 miles above Lower Elk Creek, a central mixing plant was erected at a bridge about 1½ miles above Lower Elk. A ½-yd. mixer at this plant produced the 11,700 yd. of concrete for the twelve structures. Piers and abutments of the bridge at the concrete plant were poured by chutes from an Insley mast hoist.

Concrete for all other structures, but one, on this 7-mile section was hauled in a 6-yd. box on a 20-yd. standard-gage dump car. At the structures, the box discharged through a gate into a 1-yd. dump bucket, which was lifted into the forms by an Industrial Brownhoist crane. This crane also excavated for the footings with a 1-yd. clamshell bucket.

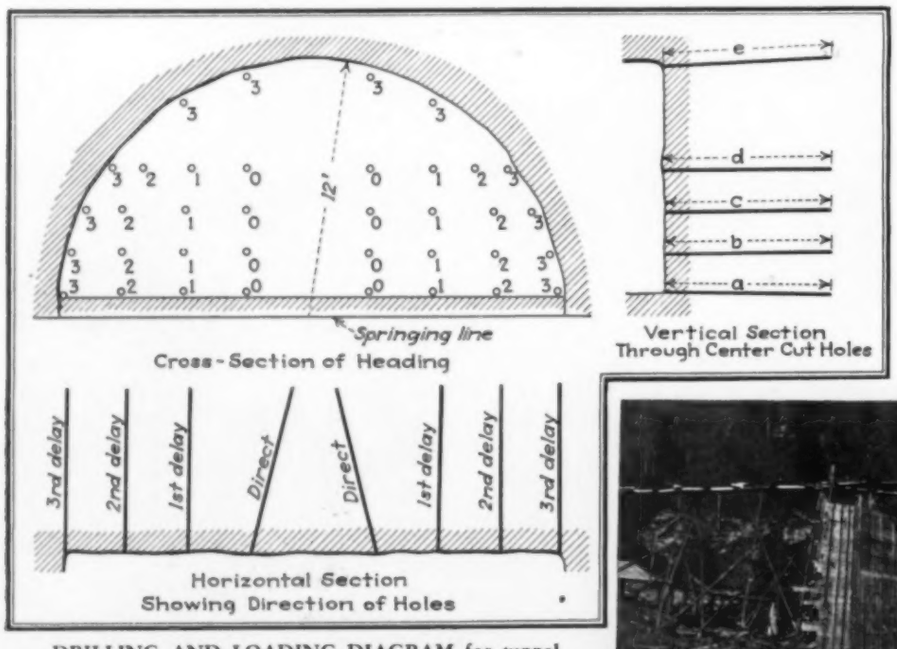
Sturm & Dillard Co. Grading—Total excavation for the 7½ miles of grading being performed by the Sturm & Dillard Co. amounted to approximately 465,000 yd. of solid rock and 200,000 yd. of other material. Five through cuts and twelve through fills are included in this section of the line. All other cuts and fills are sidehill. Cuts range up to 110 ft. in height, and fills, up to 40 ft.; the average depth of cut is 60 ft., and the average fill is 20 ft.

Two Sanderson Cyclone gasoline well drills put down the blasting holes for all cuts more than 20 ft. deep. The contractor's practice was to shoot an entire cut ahead of the shovel. Five steam shovels loaded the rock in the cuts. Hauling was done with narrow-gage and standard-gage equipment.

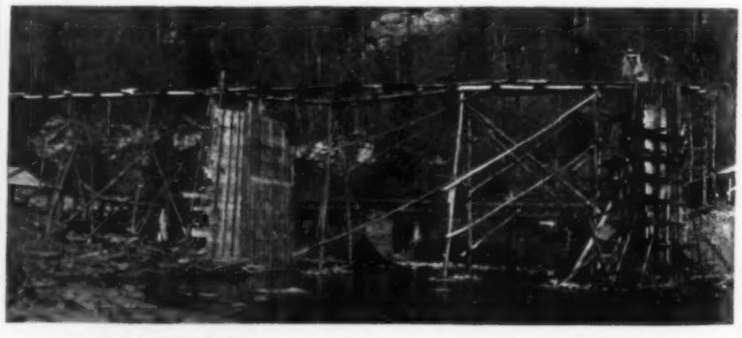
The maximum haul was 6,400 ft., and the average haul, 800 ft. Four standard-gage steam locomotives pulled trains made up from a total of 14 all-steel Western 20-yd. air-dump cars. The 36-in. gage equipment consisted of two 18-ton Porter steam dinkeys, one 21-ton Davenport steam dinkey and 40 Western 4-yd. cars. A standard-gage Jordan spreader was used on the fills.

For the lighter drilling, six Ingersoll-Rand 7x9-in. portable air compressors supplied air to jackhammer drills, of which the contractor had twenty-four. An Ingersoll-Rand type 34 sharpener kept the drill steel in condition.

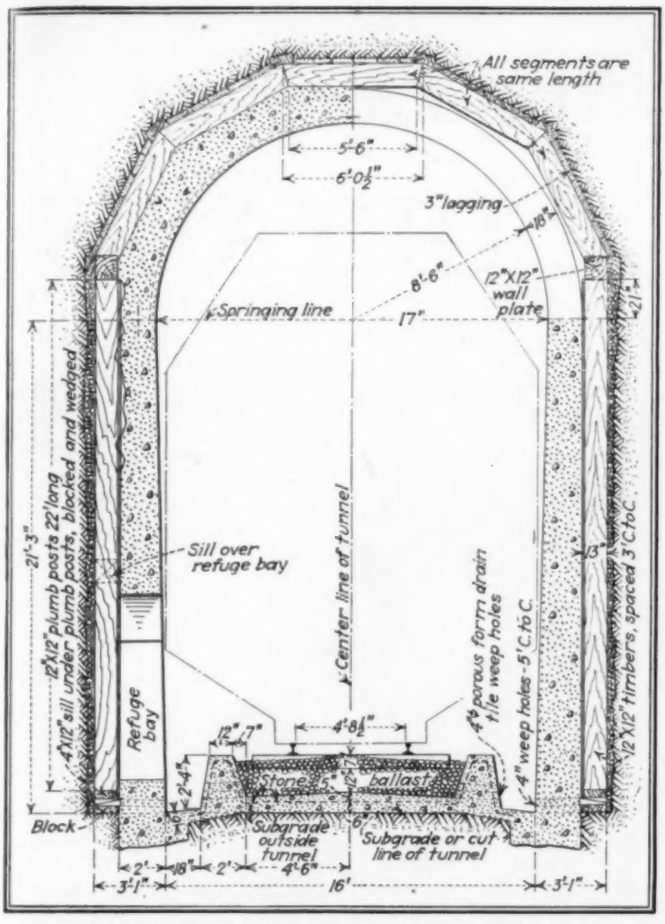
Typical Sidehill Cut—A description of the contractor's operations in one solid sandstone sidehill cut will suffice to indicate the general method fol-



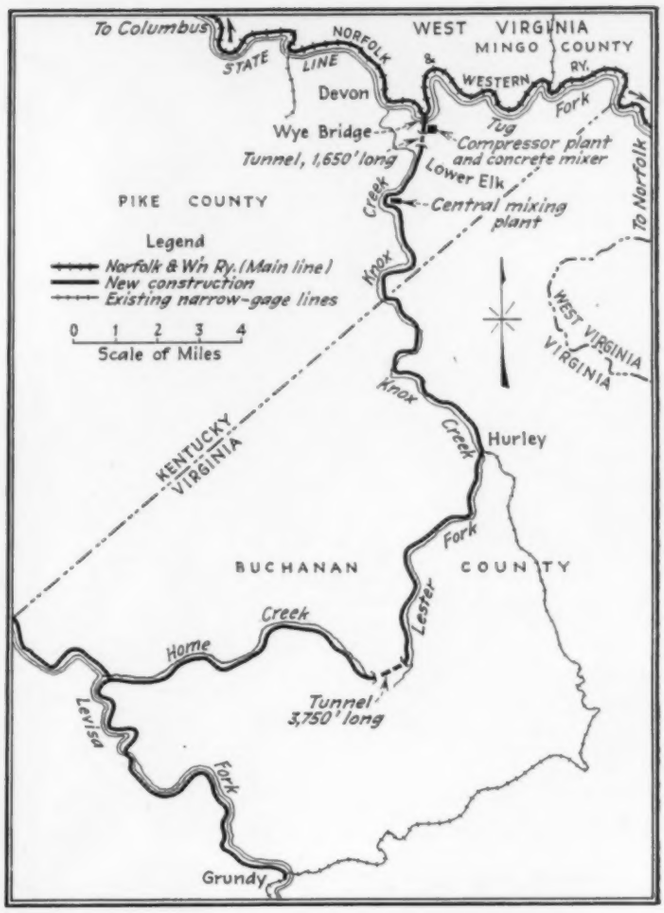
DRILLING AND LOADING DIAGRAM for tunnel heading. In cross-section, D indicates direct or instantaneous shots; (1) first delay, 4 sec.; (2) second delay, 3 sec.; (3) third delay, 3 sec. Loading of holes in vertical section is: (a) 11 dynamite cartridges; (b) 8 cartridges; (c) 8 cartridges; (d) 6 cartridges; (e) 5 or 6 cartridges.



TRESTLE RUNWAY and hand carts are used to pour piers of Knox Creek bridge 3 miles below Hurley.



TUNNEL SECTION of Norfolk & Western design used on Big Sandy & Cumberland Railroad.



LOCATION MAP. Standard-gage railroad follows narrow-gage location fairly closely from Lower Elk to Hurley and along Levisa Fork.

lowed. In a 22,000-yd. cut, 700 ft. long, with an average height on the center line of 40 ft. and on the cut line of 45 ft., the well drills put down a total of 90 holes in two rows spaced 15 ft. apart. The berm of the cut was filled with jackhammer holes. Fifteen well drill holes were shot at one time. The entire cut required 33,000 lb. of Atlas 40 per cent gelatin dynamite, an average of 1½ lb. of explosive per cubic yard of rock moved.

W. H. Anderson Construction Co. Grading—On its 3½-mile grading section, the W. H. Anderson Construction Co. moved 164,000 yd. of solid rock and 92,000 yd. of other material. The contractor used a 4-in. Red Eagle well drill on the four heaviest cuts and on a 50,000-yd. channel change, containing 70 per cent rock, which eliminates two bridges on the railroad. Lighter drilling was done with three Ingersoll-Rand jackhammers operated by two 10x8-in. portable compressors.

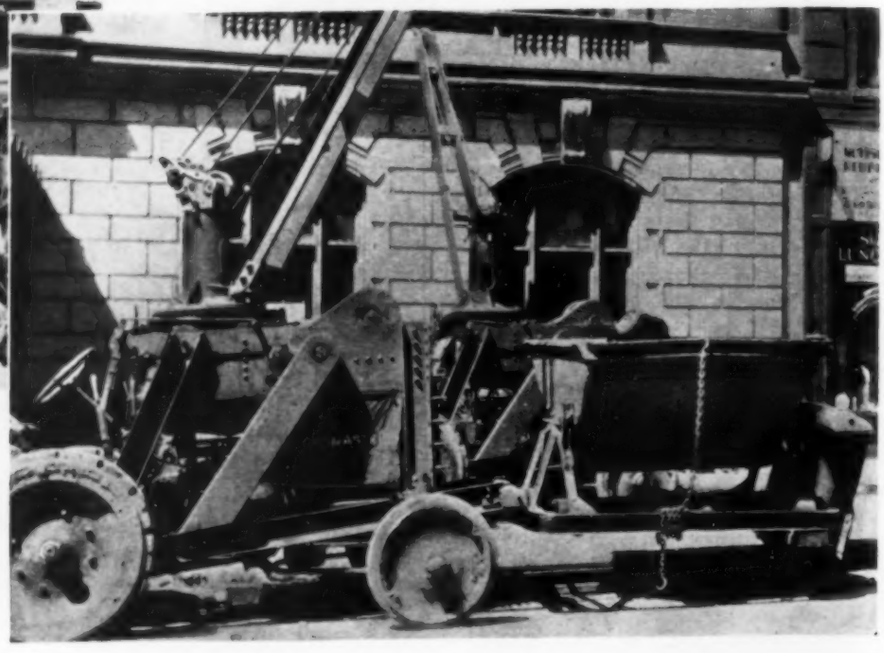
Two narrow-gage Plymouth gasoline dinkeys, one of 14-ton and one of 7-ton size, hauled the spoil in sixteen 5-yd. Western cars. Hauls were relatively short, the longest being about 1,000 ft. Approximately 25 per cent of the material in the sidehill cuts could be cast.

Personnel—W. P. Wiltsee, chief engineer, Norfolk & Western Railway Co., Roanoke, Va., is in general charge of all construction on the Big Sandy & Cumberland Railroad. J. W. Raitt, assistant engineer, Bluefield, W. Va., has direct charge of the project. In the field, the work described in this article is under the direction of two resident engineers. Roscoe Porter has charge of a residency which extends from Devon to a point on Knox Creek about 7 miles above Lower Elk. The 4 miles from this point to Hurley form one part of the residency of S. S. Ward.

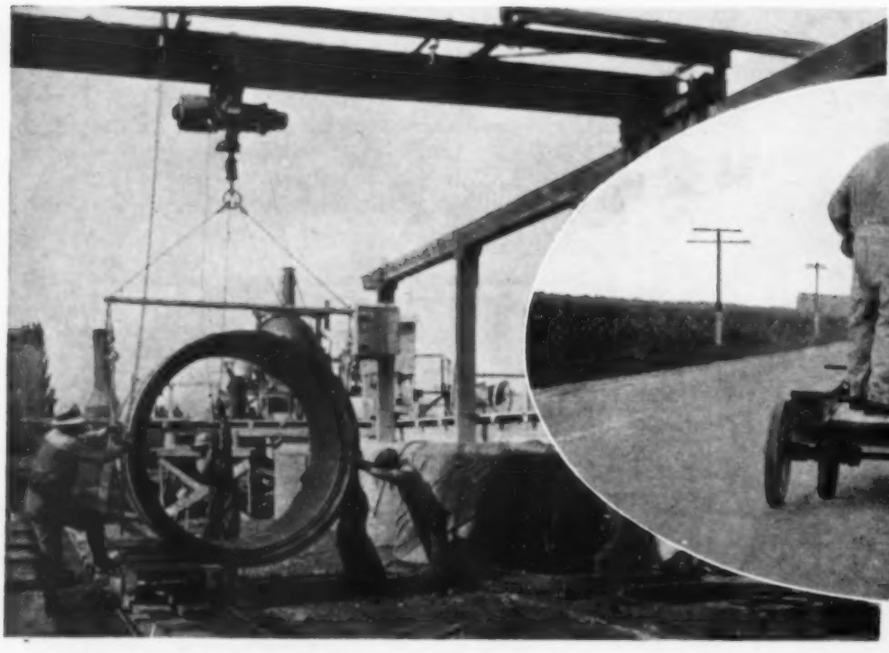
Operations of J. V. Boxley & Co. are supervised in a general way by J. V. Boxley and V. B. Mountcastle, two members of the firm. J. J. Boxley, superintendent, is in direct charge of the work. For the Sturm & Dillard Co., D. W. Fraser, superintendent, directs operations. W. H. Anderson takes an active interest in the management of his concern's portion of the work, and Frank Carrier, superintendent, maintains constant supervision.

CRANE excavates and handles concrete for bridge piers. Chute at left is pouring concrete into abutment footing from 6-yd. box on flat car. Boiler operates steam pumps.

Getting Down to DETAILS



MOBILE TRACTOR CRANE (*above and at right*) handles excavation for sewer reconstruction in congested New York streets. Clevorock, Inc., contractor, employs two rubber-tired Loadmaster units, with stabilizers on front axles, to raise 10-cu.ft. buckets from trench and discharge them into side-dump car trailers which are hauled 100 ft. and discharged as backfill.

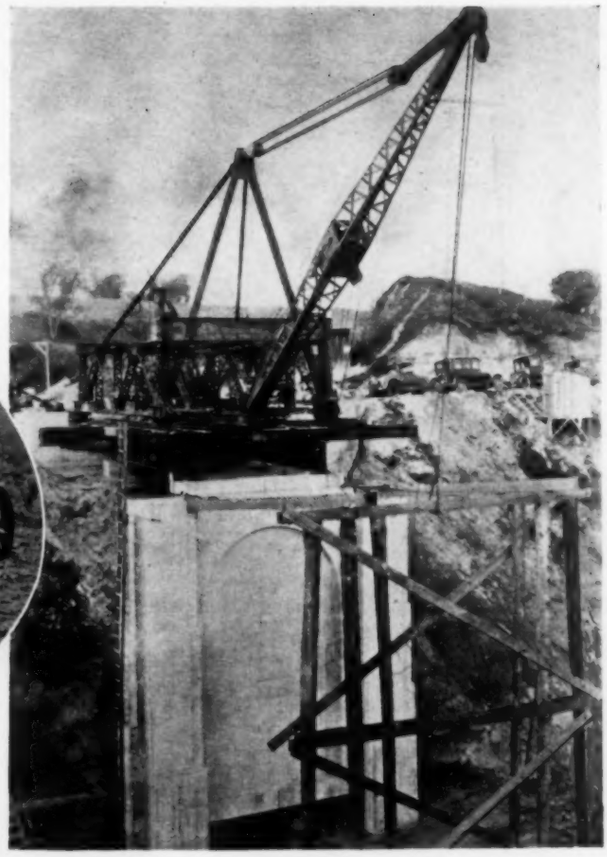


OVERHEAD I-BEAM TROLLEY proves effective in handling 72-in. precast Lock Joint pipe at Ellensburg casting yard for Kittitas project of U. S. Bureau of Reclamation in Washington.

FOR MOWING WEEDS along highway shoulders this tractor-hauled outfit with adjustable cutting blade has proved useful in Ohio.

Close-up Shots of Job Methods and Equipment

HOME-MADE HARROW *(below)* enables U. S. Bureau of Reclamation to clear sagebrush land on Kittitas project.



TRAVELER DERRICK starts erection of 800-ft. continuous span of 1,338-ft. long Missouri River bridge at Nebraska City, Neb. Kansas City Bridge Co. is the contractor.

DRAGLINE BUCKET *(left)* operated by Willamette winch on Caterpillar tractor cleans sand and gravel from long railroad culvert in Illinois.

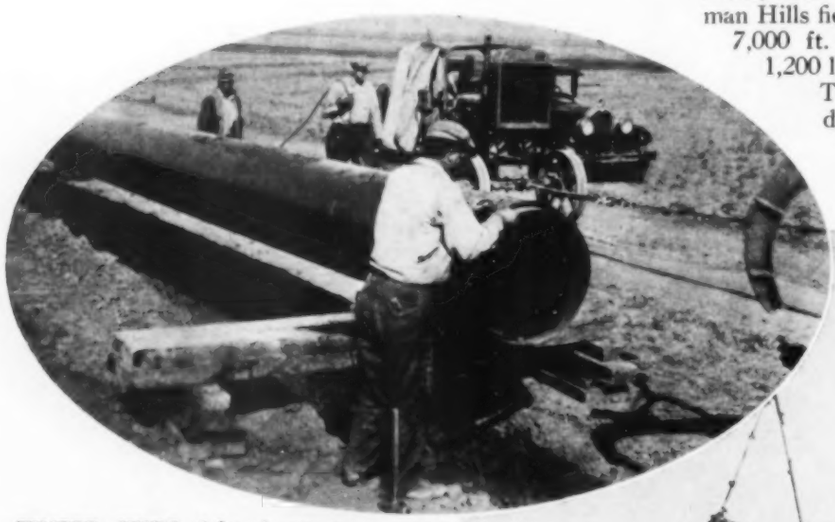
PREBUILT PANEL FORMS and structural steel reinforcement for concrete piers of St. Johns bridge, Portland, Ore., being built by Gilpin Construction Co.

Laying and Welding A MILE *of Gas Line* A DAY

LADDER-TYPE TRENCHER operates 24 hours a day, keeping several miles in advance of pipe-laying crew. Cut is 32 in. wide and from 4 to 6 ft. deep.

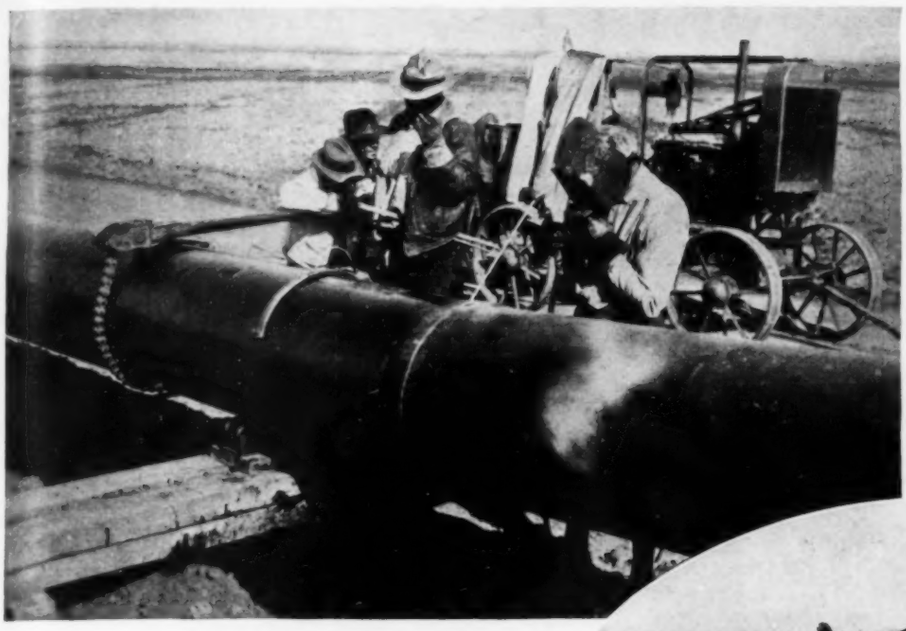
TURNING out 20 welds per day per welder on the record size, 26-in. natural gas pipe line to supply the San Francisco Bay region and central California, the welders of the A. O. Smith Co. of Milwaukee, are helping the two construction crews of the Pacific Gas & Electric Co. to complete one mile of this pipe line per day per crew. The two crews are moving at top speed, with rivalry in the output per day increasing the production. The 200-mile line, with a minimum capacity of about 138,000,000 cu.ft. per day, is being built jointly by the Pacific Gas & Electric Co. and the Standard Oil Co. of California under the name of the Standard Pacific Gas Lines, Inc. The gas supply will come from the Kettleman Hills field, the recently discovered source where wells 7,000 ft. deep are blowing off gas at a pressure of 1,200 lb. per square inch.

The major portion of the new line is 26-in. diameter, electrically welded steel pipe in 40-ft. lengths. The pipe is $\frac{3}{8}$ in. thick and weighs



TIMBER SKIDS *(above)* set to grade, support pipe for tack-welding into ten-length sections. On skids are placed 4-wheeled dollies for pipe to rest on. Pipes are belled at each end and a chill ring fitted into joint to eliminate direct pressure on weld.

TRUCK - MOUNTED CRANE *(right)* picks up 2-ton pipe length and holds it in position for first tack-weld. With generator furnishing current to tack-welder fastened to truck crane, the crew moves along one mile a day, handling 132 lengths of pipe in 10 hours or one pipe in less than 5 minutes.



AFTER FIRST TACK-WELD IS MADE *(left)*, **crane eases pipe on to dollies and the crew of two or three men with pipe tongs turns it about 180 deg. for another tack-weld.**

SETTING UP JOINT *(below)* **with pipe held by crane. This rolling welding operation produces sections approximately 400 ft. long.**

approximately 100 lb. per foot or 2 tons per length. It is shipped in trainloads from the plant of the A. O. Smith Co. in Milwaukee and transported by truck and trailer to the right-of-way from the nearest rail point. The following description of the construction applies to work being done by the Pacific Gas & Electric crews, as this was the only work under way when the line was visited.

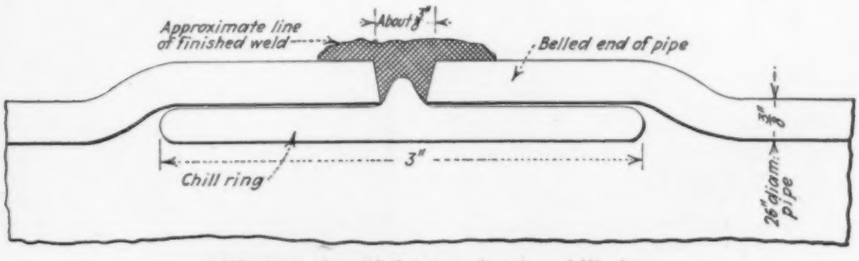
The trench is dug by a ladder-type P&H trencher except in a few places where rock excavation is necessary. Minimum depth of trench is 4 ft. to provide a coverage of at least 2 ft. and the excavator operates 24 hours per day several miles in advance of the welding crew to provide against possible breakdown.

The first step in the laying operation consists of placing the pipe on timbers spanning the trench. These timber skids to support ten-length sections of pipe are placed on a grade line and dollies are used to support the pipe. It is important to set these skids to an even grade so that the section may be turned without straining the tacked joints when the rolling welding is done. The pipe lengths are handled by a truck-mounted crane which moves beside the trench. The 2-ton pipe lengths are picked up and placed in the dollies to be tack-welded together into the sections. The pipes are belled at each end and a chill ring fits into the belled joint before the pipes are put together. This inside ring spanning the joints eliminates direct pressure on the weld and makes welding faster.

As the crane sets the pipe up to form the joint a tack-weld is made at the top. A crew of two or three men with pipe tongs then turns the pipe about 180 deg. and the tack-welder fastens the joint again. The generator is fastened to the truck crane and this crew moves along one mile per day, which means that it handles 132 lengths in 10 hours or one pipe in less than 5 min.

The next step is the rolling welding which is done with one welder to each 10-length section. Each crew consists of a welder, helper and a tong crew to revolve the pipe. As the pipe is turned the welder works continuously at top

ROLLING WELDER, aided by helper and two or three men to turn pipe, can complete 20 joints per 10-hour day.

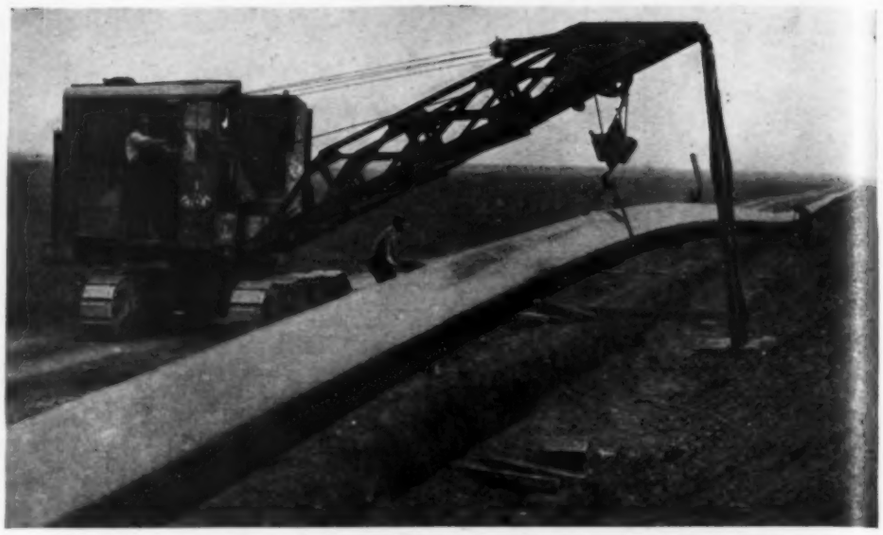


DETAILS of welded joint, showing chill ring.

welding, making a first and second weld at each joint. The A. O. Smith Co. welders complete these welds at the rate of twenty per day. The speed of this step in the work constitutes one of the large factors in the general construction speed.

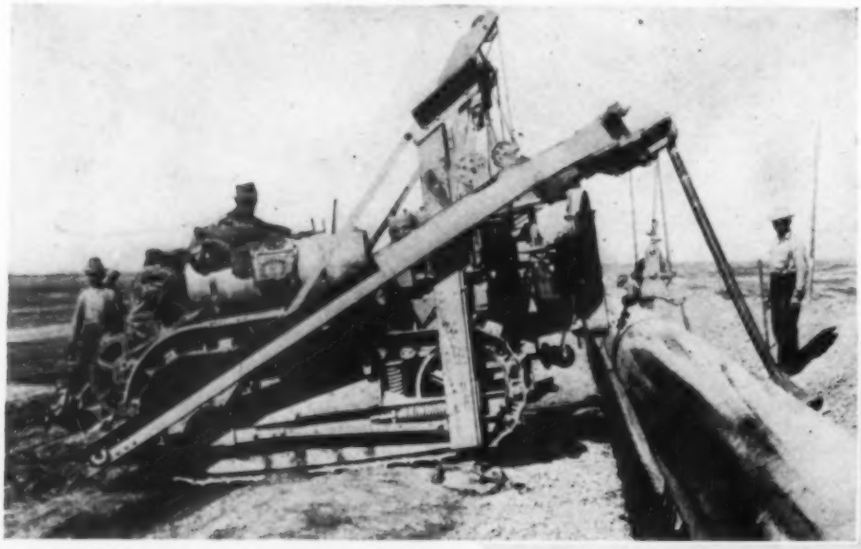
Following the rolling welding which produces sections approximately 400 ft. long, the pipe is jacked off the skids and the dollies are removed. The sections are then pulled together by Caterpillar tractors and tack-welded. These joints are completed without turning the pipe, and this work is done by members of the welding crew who are qualified to do bottom welding. The tying-in crew also is organized to turn out 1 mile of pipe line per day.

When the 1-mile section of the day's output has been tied together into a completely welded steel tube it is ready for testing before being placed in the trench. Testing is done by pumping the line to a pressure of 100 lb. with truck-mounted compressors. A removable head is used which eliminates the welding-in of a test head as was the former practice. About 40 lb. of air pressure from the previous test section is bled into the new section and the remaining 60 lb. of pressure is put on by the compressors. The circumferential joints are then tested with soapsuds. Because of the high grade of the welders and shop tests which proved the high average strength of the welds, the latter are not tested for strength in the field. The line is designed for a working pressure of about 400 lb.

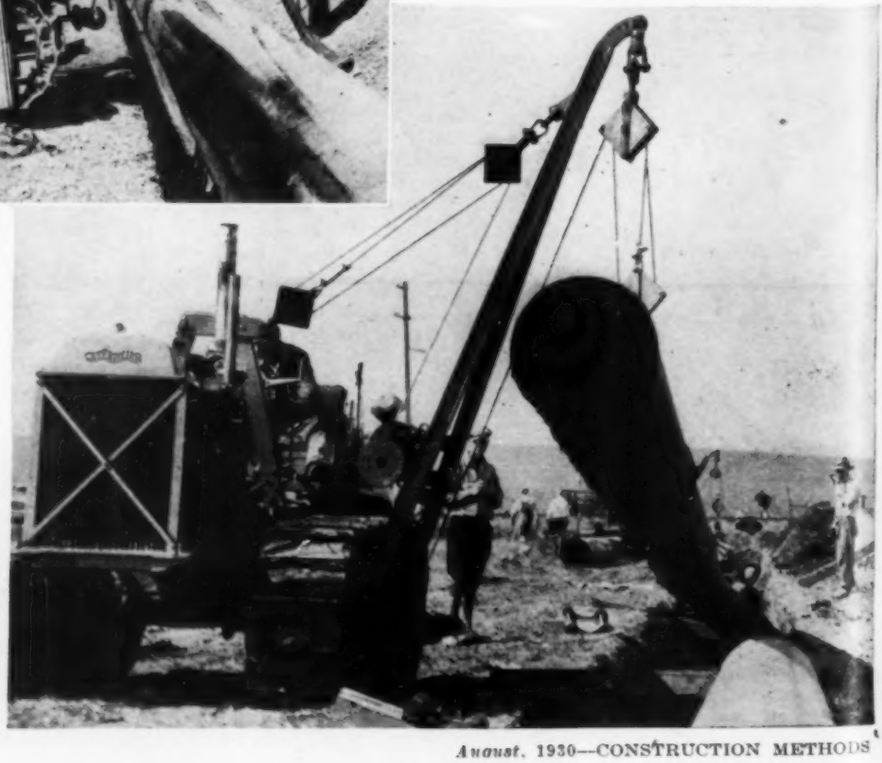


CRANE, EQUIPPED WITH STIFF-LEG extending across trench to provide stability, lays sections of completed pipe line.

No allowance for expansion is made in the line, the company's practice being to lay the pipe in compression. At about the midpoint of each 4,000-ft. section the pipe is left up on the supports above the ditch to provide slack in the line. This "hump" is lowered during the cool, early morning hours and produces compression in the line sufficient to make expansion joints unnecessary. Small vertical bends in the line are provided for by using a corrugated section of pipe commonly used



ANOTHER METHOD OF HANDLING PIPE. Caterpillar tractor *(above)*, fitted with stiff-leg, also does duty in placing pipe sections, holding them for welding and lowering them into trench.



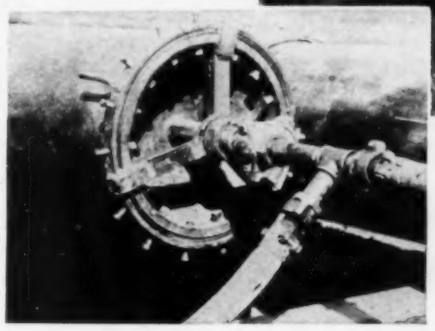
TRACTOR *(right)*, equipped with specially constructed winch and boom, performs service of crane in handling pipe line at all stages of construction.

as an expansion joint but, in this case, successfully used for the other purpose.

After testing, the line is painted with a prime coat and a second coat of asphaltic paint as it rests on the skids. A crew with brushes walks along and paints the pipe as the hot paint is supplied from a horse-drawn kettle.

Laying is done by means of a crane or a Caterpillar tractor equipped with a stiff-leg which extends across the ditch and provides stability. Skids are removed and the paint coat is patched.

TRUCK-MOUNTED COMPRESSORS *(above)* test 1-mile sections by putting on 100-lb. pressure, using removable test head.



REMOVABLE TEST HEAD, devised by Superintendent R. A. Hansen, eliminates welding in of a head and cutting it out again after testing.

The pipe then is lowered into the ditch and is ready for backfilling. Valves are set in the line at about 5-mile intervals except in broken country where the distance is shortened to 2 miles.

Crews work out of camps placed at 40-mile intervals along the line. Because of the rush nature of the work, they leave camp at daylight and return at dusk. They are paid from the time they leave camp in the morning until they finish the day's work at the job.

Construction work for the Pacific Gas & Electric Co. is under the supervision of W. S. Yard, vice-president in charge of gas construction and operation, with R. S. Fuller, engineer of distribution, in direct charge of the project. R. V. Wilson, assistant engineer, and R. A. Hansen are in charge of field construction, with J. A. Love and C. F. Meyers, directing the operations of the two crews.

Details of the plan for joint ownership of the pipe line were worked out under the direction of K. R. Kingsbury, president of the Standard Oil Co. of California and A. F. Hockenbeamer, president of the Pacific Gas & Electric Co.

R. A. HANSEN *(right)*, superintendent of two field crews and J. A. LOVE, foreman of one of the crews.

BACKFILLING TRENCH *(left)*, after pipe has been lowered, with tractor equipped with bulldozer.

Ninth of a series of articles on the $325,000,000 construction program for flood control in the Mississippi Valley

The Defense Against OLD MAN RIVER-IX

By ROBERT K. TOMLIN
Editor of *Construction Methods*

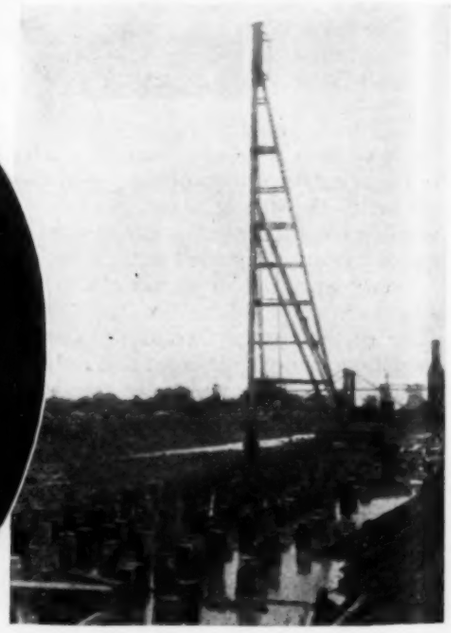
Building the Bonnet Carré Spillway

TO PROTECT New Orleans from Mississippi River floods the Bonnet Carré spillway is being built at Sellers, La., 28 miles upstream from the city, to bypass into Lake Pontchartrain, north of New Orleans, and thence to the Gulf of Mexico, flood flows above El. 20, measured from mean gulf level. The spillway structure which Stevens Bros. & the Miller-Hutchinson Co., of St. Paul, Minn., are building under the direction of Major W. H. Holcombe, Corps of Engineers, U. S. Army, district engineer, and W. A. Wells, area engineer, consists of a concrete weir

SOUPY GUMBO on line of spillway indicates necessity for timber pile foundation. Note worker knee deep in mud.

© Harris & Ewing

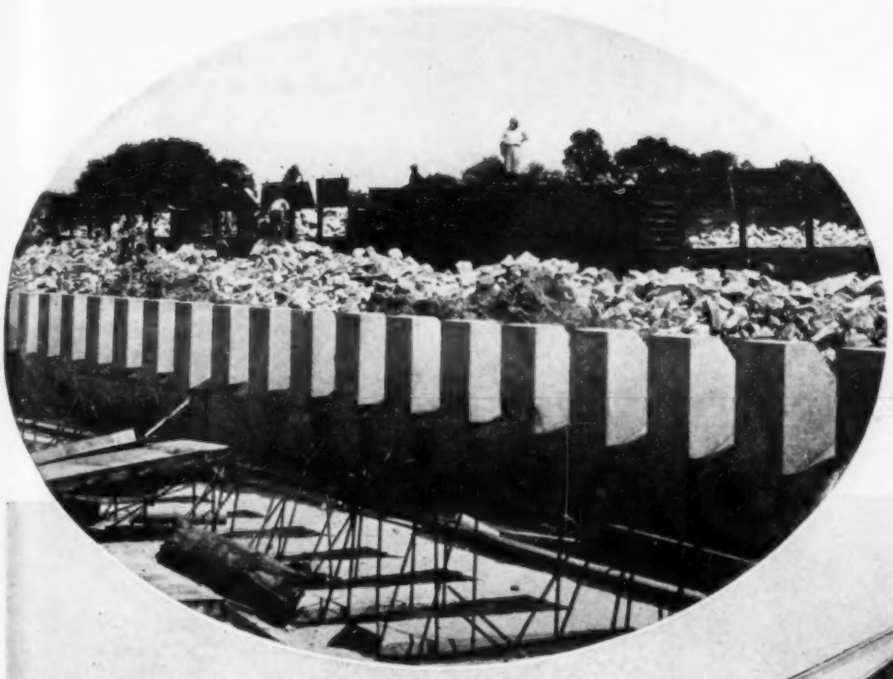
MAJOR W. H. HOLCOMBE, Corps of Engineers, U. S. Army, district engineer at New Orleans.



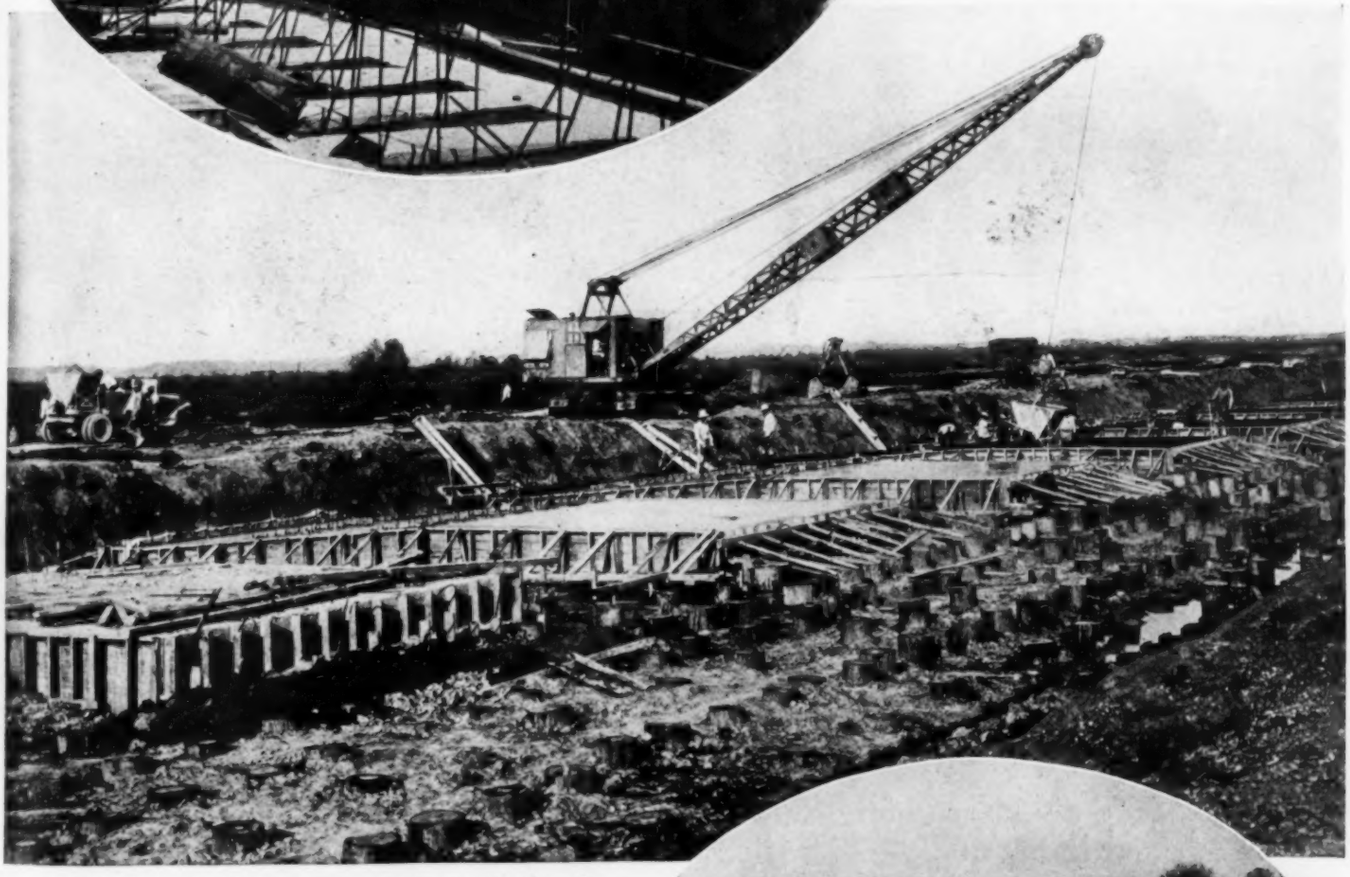
SPILLWAY SUBSTRUCTURE in soft material required the driving of 750,000 lin.ft. of timber piles with steam hammer rigs.

PIER FORMS in place for concrete spillway 7,698 ft. long, involving 350 needle-dam weir sections over which water will enter floodway en route to Lake Pontchartrain, bypassing New Orleans.

of the weirs at two different elevations (El. 16 and El. 18), resulting in overall heights of 8 and 10 ft. for the weir sections. This makes it possible, by proper manipulation of the needles, to regulate the discharge capacity according to varying river stages. From each end abutment of the spillway guide levees of earth, about 20 ft. high, are being built to confine the discharge within a floodway more than 2 miles wide, extending about 6 miles north from the spillway to Lake Pontchartrain.



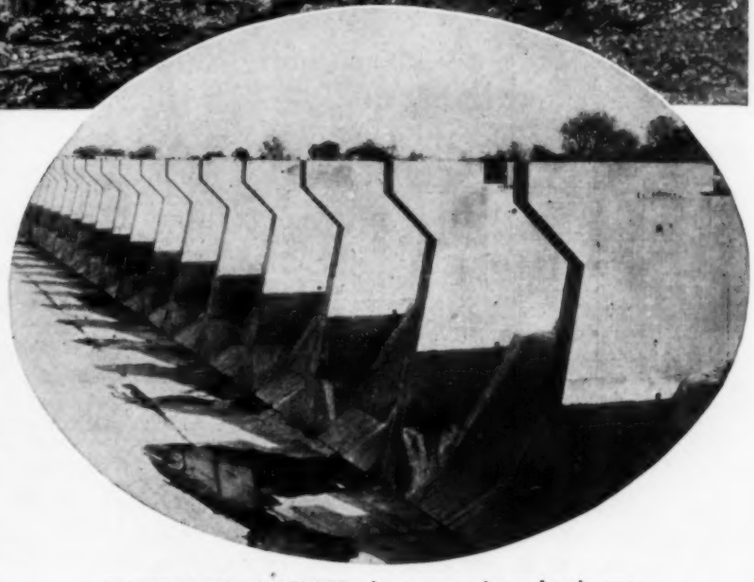
BAFFLES *(left)* in the form of a double row of concrete teeth in the stilling basin will check the velocity of water passing the spillway.



CONCRETE APRONS are constructed on both sides of the pier-and-weir section of the spillway to prevent scour. Crawler crane delivers to forms concrete buckets brought by motor truck from central mixing plant.

and needle dam 7,698 ft. long, parallel to and connected with existing levees along the river, with paved concrete aprons along both its upstream and downstream sides to resist scour and water impact. The spillway comprises 350 weir sections, each 20 ft. in length, between pairs of concrete piers spaced at regular intervals along the entire length of the structure. The estimated cost is more than $3,000,000 and the contract time for completion 530 calendar days.

Flow of water over the weir sections will be controlled by a series of needles, raised or lowered from an operating bridge extending along the tops of the piers. Flexibility in operating the spillway during high water stages is facilitated by building the crests



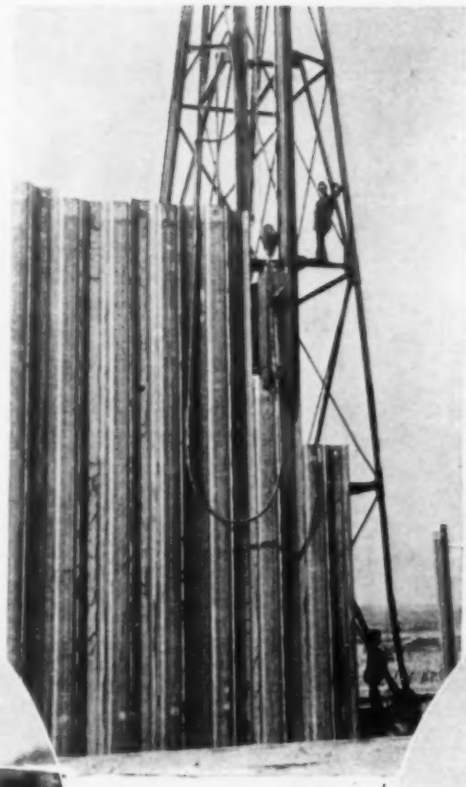
COMPLETED PORTION of concrete pier-and-weir construction for Bonnet Carré spillway.

Concrete Aprons—On the upstream side of the spillway a rear apron, in the form of a reinforced concrete slab from 20 to 30 ft. wide and 6 in. thick, extends the length of the structure. On the downstream side water passing the crests of the weirs will have its velocity checked by a wide shallow stilling pool containing two rows of staggered concrete baffles in the form of triangular teeth projecting from 3 to 5 ft. above the 2½-ft. thick fore-apron floor slab.

Articulated Slabs—The downstream end of the stilling basin, with its double line of baffles or dentated sills, connects with a strip of articulated concrete slab paving, from 175 to 225 ft. wide, made up of 3-ft. square concrete blocks, 6 in. thick, reinforced with copper-bearing steel wire. The purpose of this flexible jointed paving is to prevent surface erosion by the water as it enters the floodway channel on its 6-mile trip to Lake Pontchartrain. The articulated slab paving for about the first 100 ft. of its width is supported by a riprap base 2½ ft. thick, and for the remainder of its area by a 12-in. gravel base. The edges of the individual blocks forming the articulated mat are beveled to throw water upward rather than underneath them.

Cut-off Walls of Steel Sheeting—Extreme precautions have been taken in the design to prevent water from seeping underneath the spillway structure and undermining it. To this end two rows of long interlocking steel sheet piling, one at the end of the fore apron and the other at the junction between the stilling pool and the articulated slab paving, downstream from the weir section, have been driven to form cutoff walls, from 45 to 55 ft. deep on the upstream and 25 ft. deep on the downstream sides.

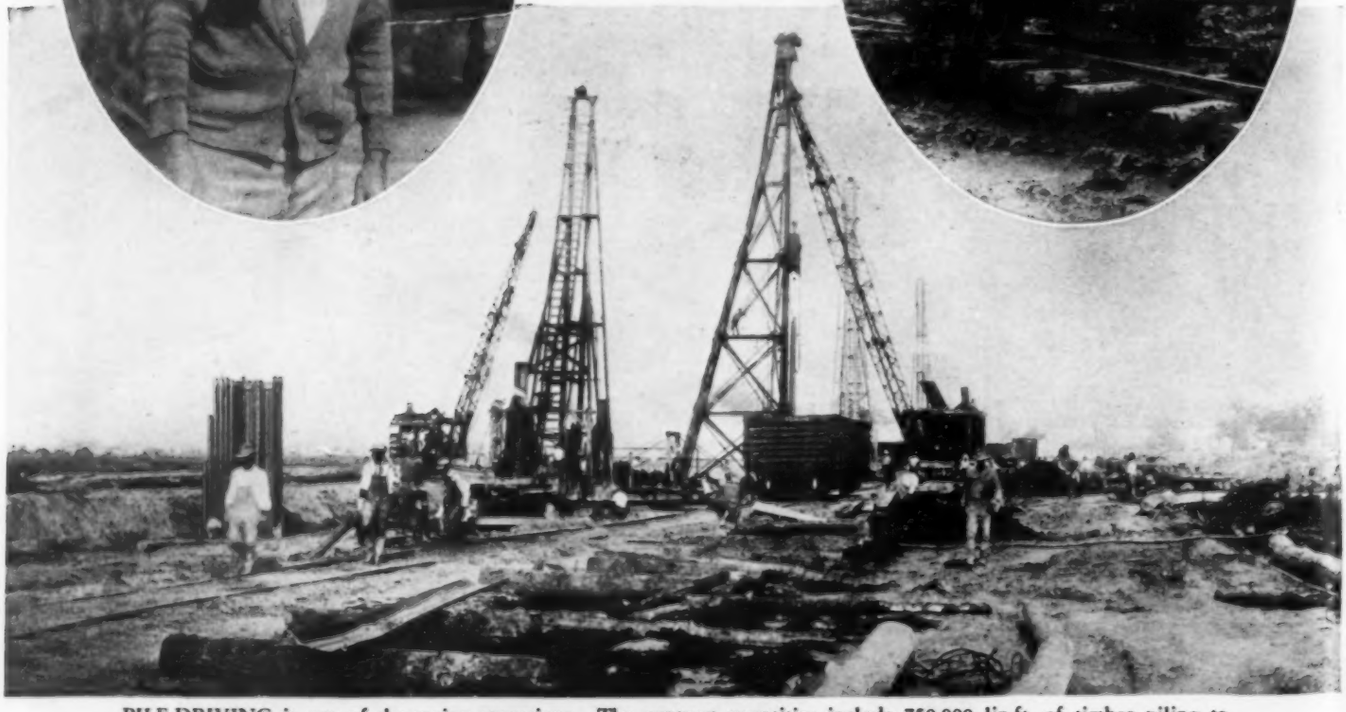
Construction Methods — From the point of view of construction the four major operations in building the Bonnet Carré spillway are those of excavation, piledriving, concreting, and plac-



STEEL SHEET PILING, aggregating 600,000 sq.ft., is driven in two lines to form water cutoffs along both sides of spillway.

M. R. LAWLER *(below)* assistant engineer on construction of Bonnet Carré spillway.

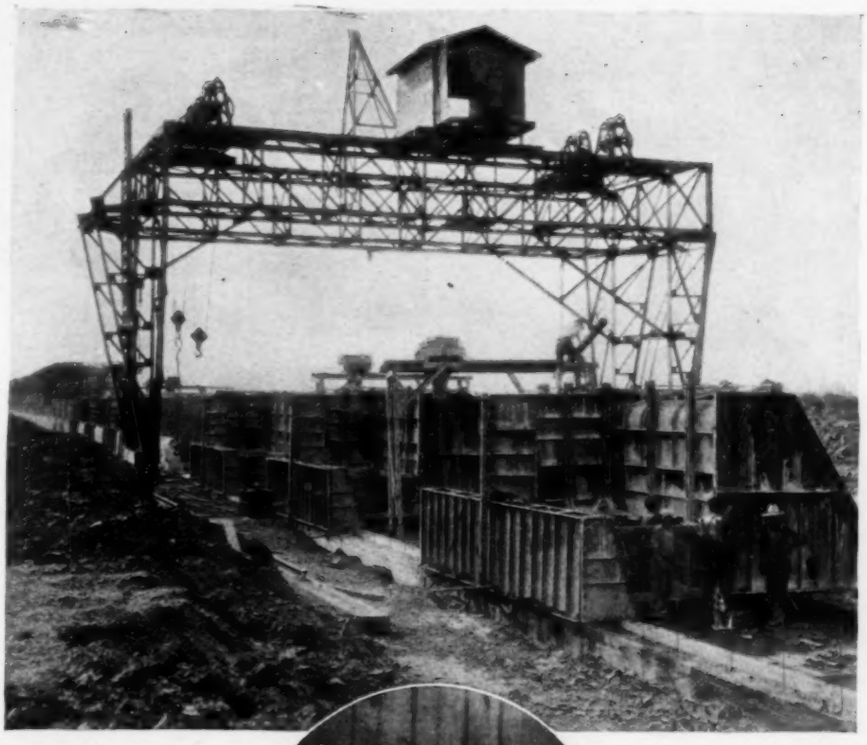
TRACK SHIFTING is done by machine which picks up rails and ties and moves them laterally.



PILE-DRIVING is one of the major operations. The contract quantities include 750,000 lin.ft. of timber piling to support the concrete spillway structure and 600,000 sq.ft. of interlocking steel sheet piling to form cutoff walls on both sides of pier-and-weir section.

ing stone spalls and riprap for the aprons. The material at the spillway site, clay and gumbo, is soft and wet, calling for a timber pile support underneath the entire 7,698-ft. length of the concrete pier and weir section.

Preliminary operations by the contractor involved the laying of about 4 miles of standard-gage railway track for handling excavation from draglines and delivering wood and steel sheet piling, forms, reinforcement and other materials, except concrete, which is transported in buckets by motor trucks from a central mixing plant.



TRAVELING GANTRY *(above)* **handles steel forms for piers and weirs of concrete spillway.**

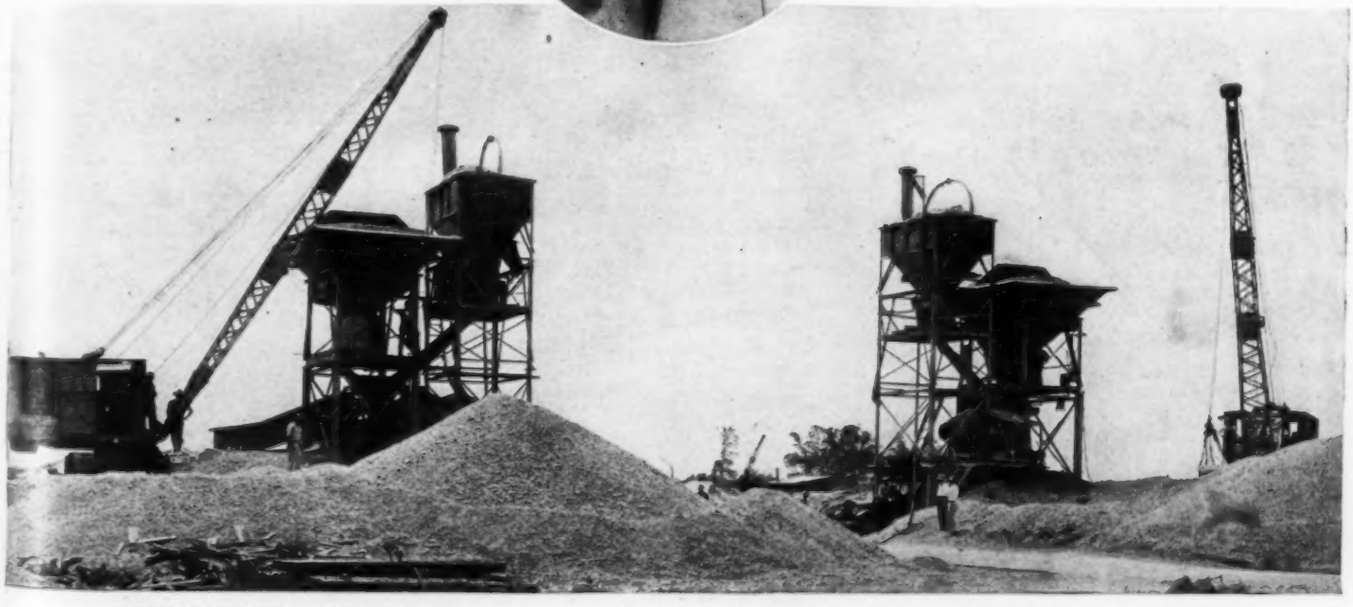
R. C. HUTCHINSON *(left)* **and H. W. MILLER of the Miller-Hutchinson Co., contractors.**

Excavation for the foundations of the pier and weir section of the spillway and for the fore and rear aprons was accomplished by Northwest draglines on crawlers, delivering into Western side-dump cars hauled in trains by Plymouth gasoline locomotives. The job involved a considerable amount of railroad track shifting, which was done mechanically by a Nordberg machine as illustrated.

Pile - Driving — Pile - driving was done under a subcontract by Doullut & Ewin Co., Inc. For the pier and weir foundations round timber piles from 65 to 70 ft. long were driven in rows by Vulcan steam hammer rigs. A total of 750,000 lin.ft. of wood piling was required.

On the driving of the two 7,700-ft. long rows of steel sheet piling, made up of about 600,000 sq.ft. of Jones & Laughlin 18-in special deep-trough sections, the subcontractor employed McKiernan-Terry hammers, operated from American Hoist & Derrick cranes. These piles were driven two at a time to form water cutoffs 25 ft. deep on the downstream and from 45 to 55 ft. deep on the upstream side of the concrete spillway structure.

Central Mixing Plant—Concrete for the piers, weirs and aprons of the spillway is mixed at a central plant, handling Universal Atlas and Lehigh cements in bulk by means of a Fuller-



DUPLICATE CENTRAL PLANTS mix concrete which is carried to job in buckets by motor trucks. Cranes handle aggregates to bins. Cement in bulk is transferred by pneumatic conveyor system.

Kinyon pneumatic conveying system supplied with air by Ingersoll-Rand compressors. The plant, as illustrated, comprises duplicate units of Blaw-Knox elevated bins and batchers and 1-yd. Smith tilting mixers. Sand and stone are unloaded from a railway spur by a pair of Koehring cranes operating clamshell buckets.

The mixers are elevated over concrete paved runways to discharge by gravity into Insley bottom-dump buckets, which are transported to the forms by a fleet of Reo speed wagons and Ford trucks. After the concrete slab for the spillway fore-apron had been cast it served conveniently as a roadway for the trucks delivering concrete for the rest of the structure.

At the apron and spillway base forms Koehring crawler cranes pick the concrete buckets from the trucks and discharge them directly to place. Pouring in alternate sections facilitates placing of expansion joints.

For the pier and weir construction the contractors are using specially designed Blaw-Knox steel forms, handled by a self-propelled gantry traveler and moved to new positions, after each pour, in four pieces. The gantry, as shown in one of the photographs, is a structural steel frame straddling the line of the pier-and-weir section of the spillway. Its vertical legs are equipped with flanged wheels riding on rails. On the overhead platform of the gantry traveler winches and fall blocks with hooks facilitate the setting and striking of the sectional steel forms.

TRUCKS *(right)* **carry bottom-dump concrete buckets from central mixing plant to forms.**

DRAGLINES *(in oval)*, **loading side-dump railway cars, handle excavation of earth at the weir site and talus foundation. Note spillway** *(in upper photo)* **with pier and weir concreting completed.**

NEXT MONTH: Another article on construction for Mississippi River flood control.

SPALLS AND RIPRAP are placed for the talus foundation below the weir, using side-dump railway cars.

Present and Accounted For —

A Page of Personalities

BOULDER DAM BUILDER. Walker R. Young, newly appointed construction engineer, has established headquarters at Las Vegas, Nev., to direct work on the U. S. Bureau of Reclamation $165,000,000 Colorado River project

A VETERAN IN THE SERVICE. A. D. McDougall of Portland, Ore., vice-president of A. Guthrie & Co., Inc., has the distinctive record of 63 years in the construction business. Starting at the age of 18 on a railroad job, he later served for many years as construction superintendent before becoming a company executive.

DOCTOR OF ENGINEERING. Harrison P. Eddy, specialist in the field of water supply and sewerage and member of the firm of Metcalf & Eddy consulting engineers, of Boston, has received an honorary degree from Worcester (Mass.) Polytechnic Institute.

CONSTRUCTORS' CABINET. Members of president's committee which is directing the affairs of the Associated General Contractors of America. *(Left to right)* F. L. Cranford, Brooklyn, N. Y.; President A. E. Horst, Philadelphia; George B. Walbridge, Detroit; W. A. Bechtel, San Francisco; Alan Jay Parrish, Paris, Ill.; E. J. Harding, assistant general manager of the A. G. C., Washington, D. C.

NEW EQUIPMENT ON THE JOB

For Compacting Backfill

A trench roller for packing down earth over newly laid cable, conduit or pipe line is a recent development of the Trackson Co. of Milwaukee.

Built for mounting on a McCormick-Deering crawler-tractor, this machine consists of a wide steel roller

filled with concrete which weighs 3,000 to 4,000 lb., the weight varying to meet different soil conditions. For average jobs a 3,500-lb. roller is recommended.

It is claimed that a trench roller will replace as many as 20 laborers with hand tampers and will compact as much as 2,600 lin.ft. of 4-ft. trench backfill in a day.

New Leaning-Wheel Grader

New features of blade control, reach and range and the added advantage of leaning wheels are promised for the grader recently placed on the market

by the Caterpillar Tractor Co. of San Leandro, Calif.

This grader, for use with the Caterpillar 60 tractor, weighs 11,300 lb. without scarifier and introduces a new centralized control system by which seven control wheels govern the nine important adjustments of blade pitch and position, wheel adjustment and steering.

Correct pitch of blade is maintained by the 3-point control. Wide range and reach are made possible by a 42-in. lateral side shift, by three positions of the connecting link between side shift and circle crossbar, by three blade position connections with the blade beams and by four positions at the extensible lifting links. These enable the blade to make a 6½-ft. reach for bank cutting and to cut a slope of 60 deg. The entire lifting mechanism is fitted with roller bearings.

Improved Road-Marker

An improvement in the operation of the road-marking device known as Traf-O-Mark, a product of Littleford Bros., Inc., Cincinnati, Ohio, now makes it possible to use this machine in connection with an automobile in-

stead of running it by hand as formerly. The painting unit is attached to the running board of the car and controlled from the driver's seat by means of a long handle. An arm, mounted on the front axle of the car and set so that the mark is automatically centered by maintaining the dangling chain at the edge of the road as the car advances, makes the usual preliminary guide line unnecessary. Both units may be detached from the car in three minutes.

Longer-Wearing Metal Chains

Cast chains made of a new metal called Promal have been placed on the market by the Link-Belt Co. of Chicago. These chains were developed after extended research to provide longer life for drive and conveyor chains operating under heavy loads or abrasive conditions.

Compared with malleable iron, Promal has an average yield point of 45,000 lb. as against 36,000 lb.; an average ultimate strength of 65,000 lb. as against 54,000 lb.; an average elongation of 14 per cent as against 18 per cent, and a Brinell hardness of 170-190 as against 110-130.

A Utility Shovel

A convertible ¾-yd. three-quarters swing, clean-up shovel weighing less than 10 tons is a new product of the Byers Machine Co., Ravenna, Ohio.

This machine is similar in design to Byers' full-circle models, having the di-

rect type of drive and all deck machinery mounted in one unit steel casting. Crawlers operate with double steer through a single 5¼-in. diameter travel shaft in the car body.

Has Greater Digging Power

The G. H. Williams Co. of Erie, Pa., announces an improved Champion clamshell bucket especially built to insure increased digging power and speed.

In the head construction the com-

bined use of cast and rolled steel parts has given greater rigidity and strength for hard digging. Added digging leverage is assured by cast steel brackets which extend beyond the backs of the scoops. The all-welded scoops are scientifically designed for easy filling and perfectly smooth inside.

ARE YOU USING THE RIGHT TIRES FOR

"GOODYEAR ALL-WEATHER TREAD DUMP TRUCK TIRES GIVE US THE UTMOST IN TRACTION AND MILEAGE", SAYS MR. ARTHUR BANGERT, PRESIDENT, BANGERT BROS. CONSTRUCTION COMPANY, FERGUSON, MO.

DUMP TRUCK WORK?

Almost every kind of trucking makes different demands on tires. Some trucks must cover long distances at high speeds—others must make frequent stops and starts—some must operate where there are no roads—still others must carry tremendous loads at slower speeds on paved streets and highways.

But one name identifies the right tire for every hauling job.

That name is GOODYEAR.

When you go to a Goodyear Truck Tire Service Station Dealer, you get careful, accurate recommendations showing exactly the right type of tire suited to your hauling job.

Whether your trucks work in excavations or haul building materials to construction jobs, they have to carry heavy loads where the ground is soft and tires need powerful traction. And they get that traction in the Goodyear All-Weather Tread.

There's a special Goodyear Dump Truck Pneumatic, a brute of a tire, with traction bars on the sidewalls. Many trucks are now adopting the new Goodyear Truck Balloon—it is spectacular in its ability to keep going under hard hauling conditions—as well as for its speed and mileage on the open road. Everything that balloon tires did for passenger cars, this new Goodyear Tire now does for trucks.

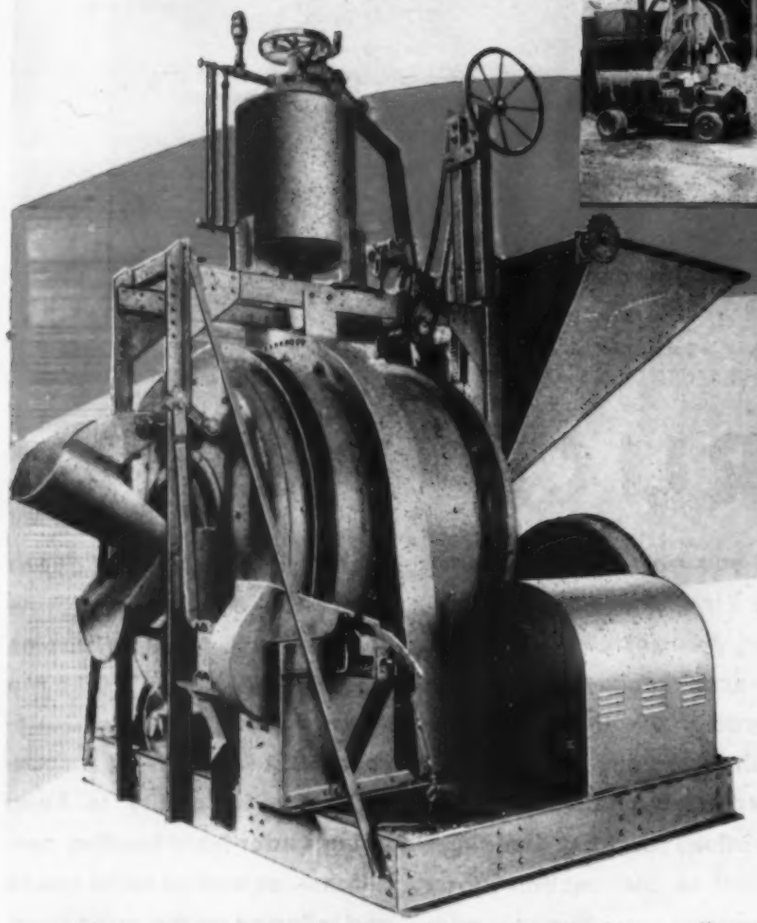
ON YOUR NEW TRUCKS SPECIFY GOODYEARS

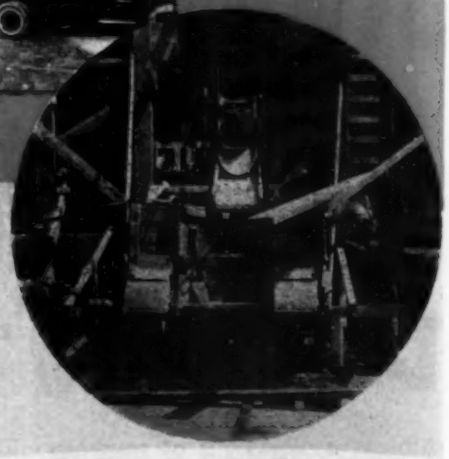
GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Ransome

Two of the five 2 yd. Ransomes owned by the General Material Company, of St. Louis, Mo.





The Turner Construction Company used three 42-S Ransome Standard Building Mixers—the Raymond Concrete Pile Co. one 28-S—on the D. L. & W. Warehouse at Jersey City, N. J.

Below are extracts of letters from owners of Ransome 56-S Standard Building Mixers—

"Mixer No. 1 mixed approximately 200,000 cu. yds. at_____before being moved to_____, where it has mixed another 75,000 cu. yds."

"We put 250,000 cu. yds. through this Ransome and have no difficulty in maintaining 40 batches per hour, allowing a full minute mix." This mixer, by the way, was *not* equipped with a power discharge. Present mixers, due to improvements and power discharge, *are even faster!*

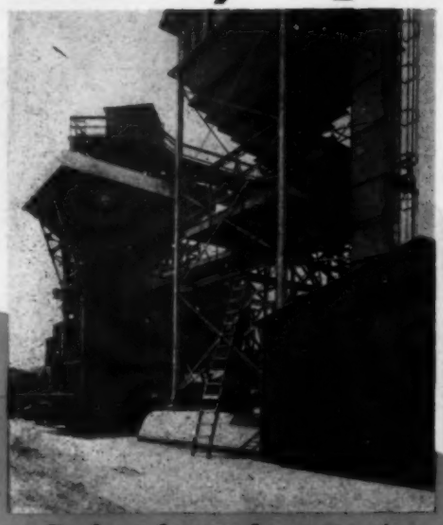
"We have put 370,000 cu. yds. through two Ransome Big Mixers. They have given entire satisfaction."

"After mixing 320,000 cu. yds in your two mixers we estimate them 75% as good as new."

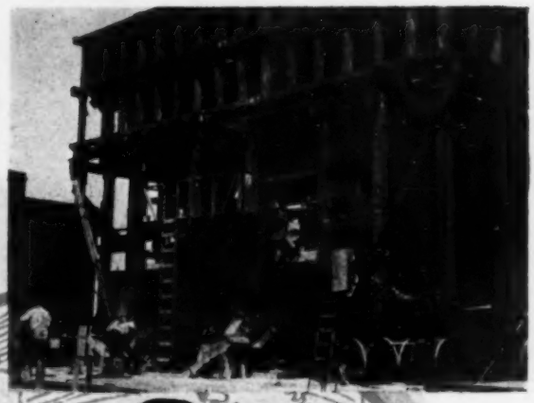
"A 28-S Standard Ransome Building Mixer with a hand discharge maintained a continuous output of 45 batches per hour with a full minute mix."

Speed...Endurance...L—O—N—G LIFE!

BIG MIXERS
28-S, 42-S, 56-S and 84-S
for LONG LIFE



Two Ransome 28-S Mixers ran every day without a breakdown from April 3rd to October 1st, pouring 50,755 cu. yds. Contractor —Raymond Concrete Pile Co.—San Francisco Bay Toll Bridge.

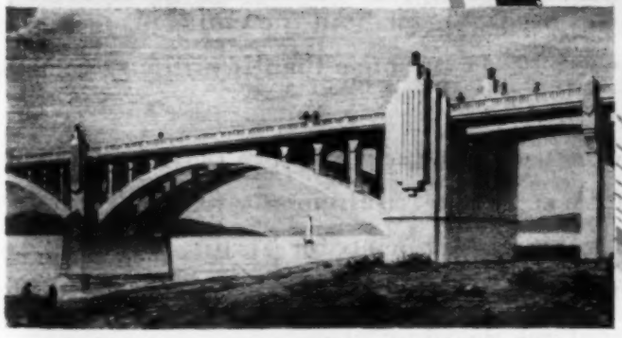


The Super Concrete Corperation of Washington, D. C., has a Ransome 84-S. They wired the following response to an inquiry from a prospective purchaser— "Have been operating for 60 days without any trouble whatever—We do not think you will make a mistake by buying a Ransome Mixer."

RANSOME

REG. U.S. PAT. OFF

AMERICA'S FIRST MIXER



The Wiley-Maxon Construction Co. used two 28-S Standard Building Mixers on the longest multiple arch concrete highway bridge in the world, Columbia to Wrightsville, Pa., over the Susquehanna River.

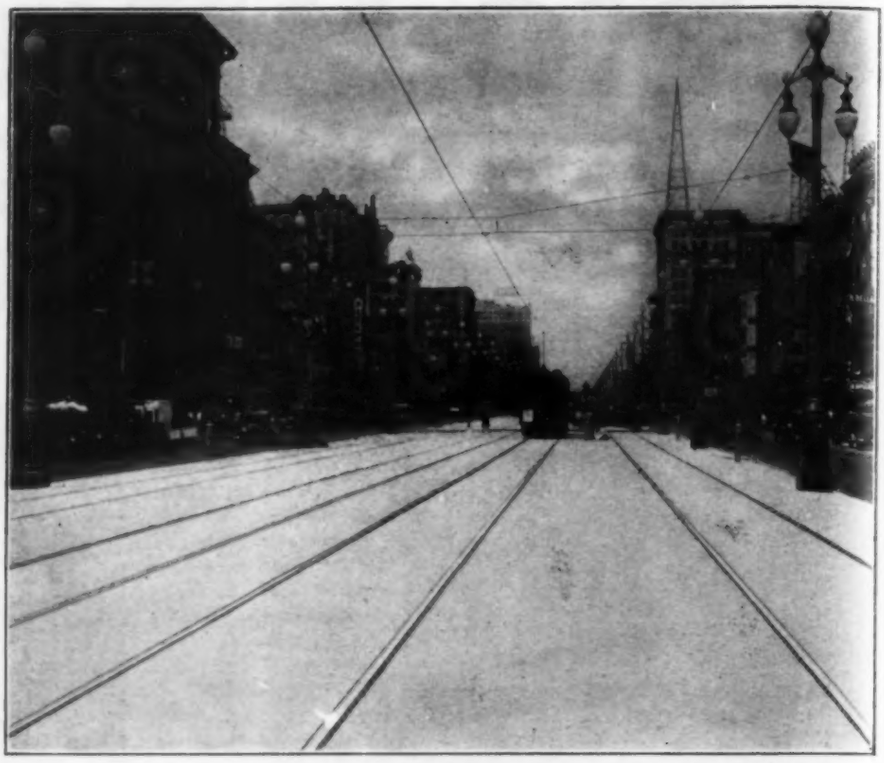
Send for Bulletins on Ransome Big Mixer

Ransome Concrete Machinery Company

1850 — Service for 80 Years — 1930

Dunellen **New Jersey**

11 DAYS SAVED



Canal Street, New Orleans. Driveways, area between car tracks, and sidewalks were all paved with "INCOR" Concrete.

CANAL STREET, New Orleans, said to be the widest thoroughfare in the world, has seen history in the making ever since 1838 when it ceased to be a drainage ditch. This year the famous old street made history itself; for in what probably stands as record time for a job of this magnitude, it was completely repaved in two months. To repave the streets and have them ready in time for the Mardi Gras, a total of 42,000 barrels of "INCOR" Cement was used. Throughout the entire project, barricades were removed 11 days sooner than if ordinary cement had been used.

"INCOR" is a Perfected High-Early-Strength *Portland* Cement, guaranteed to conform to all requirements of the Tentative Specifications of the American Society for Testing Materials . . . it produces dependable Portland Cement concrete ready to use in 24 hours . . . contains no admixtures . . . requires no special methods of handling . . . and the cost of "INCOR"* Concrete is less than the cost of early-strength concrete of like requirements produced by special methods with ordinary cement.

* Reg. U. S. Pat. Office

"LONE STAR" and "INCOR" Cements
made and sold by
LONE STAR CEMENT COMPANY ALABAMA
LONE STAR CEMENT CO. INDIANA, Inc.
THE CUBAN PORTLAND CEMENT CORP.
LONE STAR CEMENT CO. PENNSYLVANIA
THE LONE STAR CEMENT CO. (KANSAS)
LONE STAR CEMENT CO. VIRGINIA, Inc.
LONE STAR CEMENT CO. NEW YORK, Inc.
LONE STAR CEMENT CO. LOUISIANA
ARGENTINE PORTLAND CEMENT CO.
LONE STAR CEMENT COMPANY TEXAS
URUGUAY PORTLAND CEMENT COMPANY
Subsidiaries of the
INTERNATIONAL CEMENT CORPORATION
342 MADISON AVENUE, NEW YORK, N. Y.

"INCOR" PORTLAND CEMENT
LONE STAR CEMENT

INTERNATIONAL CEMENT CORPORATION

Without extending the boom length, a LORAIN Center Drive crane has a 10 to 15% advantage in working range, because it can pick up the load, swing the boom around, and at the same time travel toward the unloading point, just like a locomotive crane.

THE THEW SHOVEL CO.
LORAIN • OHIO

THEW LORAIN

45 — 55 — 75

Cut Out This Man

You no longer need a "wagon skinner." Put his wages in your pocket. Western Crawler dump wagons no longer have to be "wound up." We have perfected a practical, automatic, entirely mechanical device for closing the doors after dumping. It is simplicity itself and acts instantly. The entire mechanism is mounted on the wagon and requires no special attachment on the tractor. A single trip-lever controls both dumping and closing. Your tractor driver can work that lever from his seat by means of a rope, or your dump boss can work it direct from the ground.

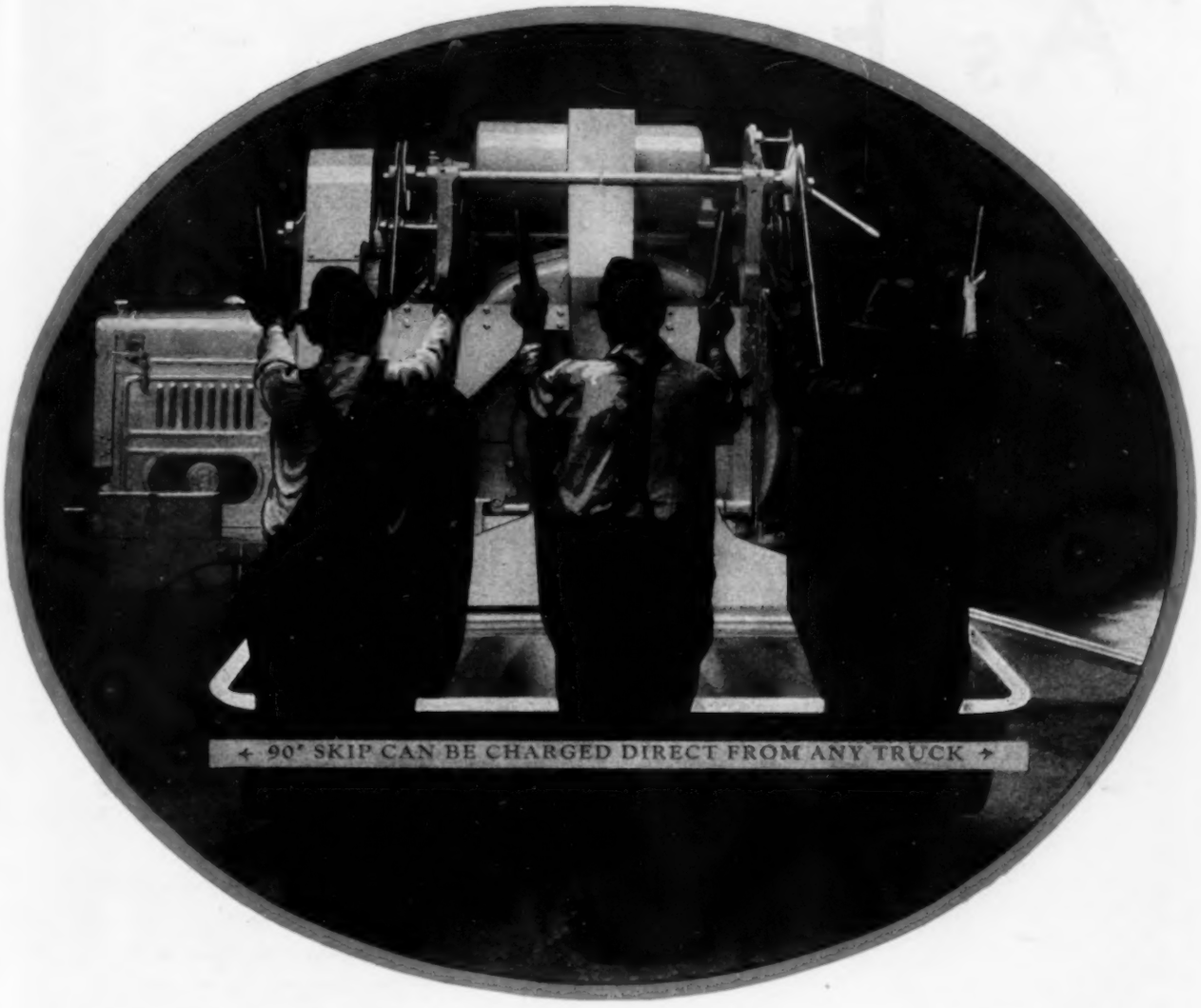
Order your new wagons equipped with this labor-saving device—or mount it on your Western Crawler wagons already in the field. Its use will release your "wagon skinner" for other work.

This whole welcome story is contained in Bulletin No. 30-JD just off the press. Where shall we send your copy?

Western Wheeled Scraper Company

Aurora, Illinois, U. S. A.

WESTERN



90" Skip Shaker Loader Makes Jaeger World's Fastest 14S Mixer!

This truck charging skip is optional equipment—at NO EXTRA COST!

BATCH by truck direct from proportioning plant to this loader and you get rigid control concrete cheaper than you can buy it anywhere, without stock piles, wheelers or bins, without a minute lost on material handling or charging, and with Jaeger's patented automatic Skip Shaker to slice more seconds off the loading operation for every batch. If you do use wheelers, three can load at one time, make real speed.

Faster concrete construction starts with a faster mixer. You need this 14S Jaeger and it doesn't cost a nickel more. Discharging time is cut to minimum, gives you a maximum thoro mix and all the easy handling of a short coupled, pivot axle, roller bearing truck, steel and ball bearing construction and original Jaeger one-man end control.

—With Patented SKIP SHAKER!

Also available with standard loader, extension track or batch hopper, on wheels or skids, gas or electric drive.

MAIL SLIP FOR CATALOG, SPECIFICATIONS, PRICES

THE JAEGER MACHINE COMPANY
800 Dublin Avenue, Columbus, Ohio

Send catalog, specifications and prices on—

☐ *Non-Tilt Mixers* ☐ *Tilters* ☐ *Pumps*
☐ *Timken Screw Thrust Hoists*

Name _____

Address _____

"As Easy as

Curing a Concrete Road!"

A PERFECTLY apt and commonplace statement now that proper curing of concrete roads is only a one-man job.

Few ways of making jobs easier and making results better have marked such an advance as that of the Calcium Chloride methods over the older methods of curing concrete.

Where surface curing is used, one man with a spreader replaces the big gang required by the old ponding and covering methods. And where Calcium Chloride is used as an admixture, road curing becomes next to no job at all.

Both Calcium Chloride methods get rid of the need for constant sprinkling and inspection. Both eliminate the need for the "final clean-up." Both methods have earned a reputation for turning out perfect road curing jobs and have won the approval of the United States Bureau of Public Roads.

Look into the facts for yourself. Write to any of the companies listed here and ask for booklet 342.

Method of curing concrete by the use of Calcium Chloride on the surface or as an admixture are both approved by the United States Bureau of Public Roads.

CALCIUM CHLORIDE PUBLICITY COMMITTEE

THE DOW CHEMICAL COMPANY - - - - - - - - Midland, Michigan
SOLVAY SALES CORPORATION - - - - - 40 Rector Street, New York
THE COLUMBIA PRODUCTS COMPANY - - - - - - Barberton, Ohio

FLAKE

CALCIUM CHLORIDE

CURES CONCRETE

Power!

This 1¾ yard OSGOOD Conqueror shovel, owned by the Corson Construction Co., moved and loaded 1150 cubic yards of material in seven consecutive hours, or 162 cubic yards an hour. With a different operator this same OSGOOD handled 890 cubic yards in five hours and forty minutes or 156 yards an hour.

Smooth, Quiet, Powerful

6-cylinder engine STRAIGHT LINE power flow

OSGOODS are POWERFUL as machines and PROFIT EARNERS. Smooth, quiet, powerful operation is made possible by the straight line power flow from the husky six cylinder engine through a silent chain and machine cut gears to the point of use. All motions of swinging, crowding and traveling are performed by only six spur and three bevel gears in the upper body. The powerful wire-rope crowd operating through racks and pinions will do everything a steam shovel crowd can do—and more. Surplus power always in reserve to handle rough going.

Power is taken from the husky six cylinder engine to the operating machinery through a heavy silent chain—the most efficient type of drive known. It is simple in construction and operation and relieves the engine from many shocks and strains common to a more rigid connection. The same silent chain connects the single electric motor to the operating machinery on an OSGOOD electric

THE OSGOOD CO.

MARION OHIO

AUSTRALIA and COLAS

THIS factory at Melbourne, pictured above, supplies the Antipodes with Colas. It is one of a world-wide chain producing this economical cold asphalt emulsion that has proved successful as a road binder here, as everywhere.

Even in the outlying ranch districts, subjected to the intense heat of long dry spells, and the destructive action of deluging rains, Colas roads have given that satisfactory, enduring service for which they are noted.

If you are interested in building economical, non-skid, traffic resisting, weather-proof roads, Colas is the binder you need. Write for details.

FLINTKOTE ROADS INC.
(COLAS LICENSEES)

Pershing Square Building, New York Park Square Building, Boston
Associated Companies Throughout the World

COLAS
REG. U.S. PAT. OFF. TRADE MARK

BUILDS DURABLE LOW-COST ROADS

INSLEY

Let Insley Engineers Solve Your Problems

N. E. C. PRODUCTS

KOEHRING
Pavers, Mixers; Power Shovels, Pull Shovels, Cranes, Draglines; Dumptors.

INSLEY
Excavators; Concrete Placing Equipment, Cars, Buckets, Derricks.

T. L. SMITH
Tilting and Non-tilting Mixers, Pavers, Weigh-Mix.

PARSONS
Trench Excavators, Backfillers.

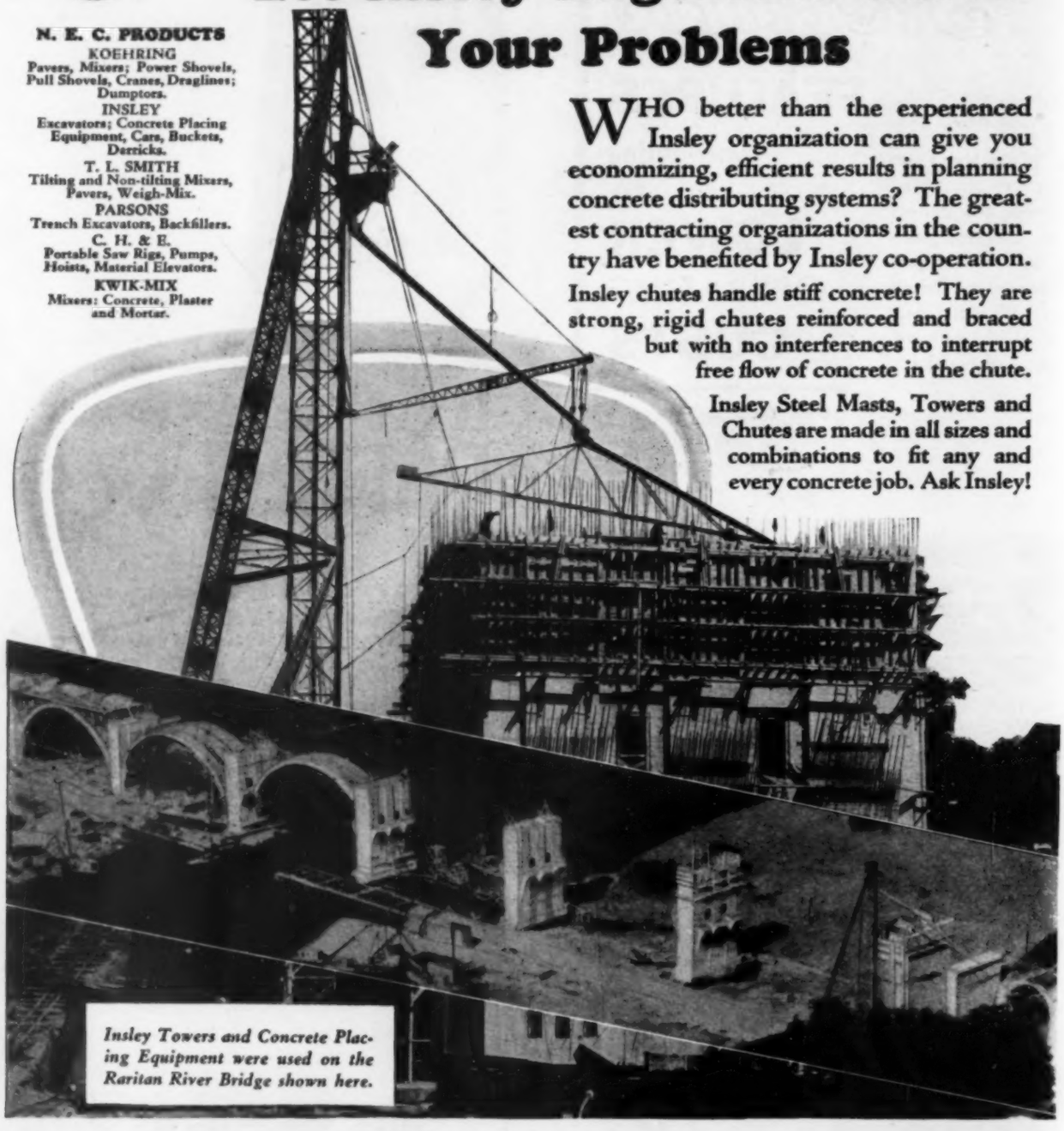
C. H. & E.
Portable Saw Rigs, Pumps, Hoists, Material Elevators.

KWIK-MIX
Mixers: Concrete, Plaster and Mortar.

WHO better than the experienced Insley organization can give you economizing, efficient results in planning concrete distributing systems? The greatest contracting organizations in the country have benefited by Insley co-operation.

Insley chutes handle stiff concrete! They are strong, rigid chutes reinforced and braced but with no interferences to interrupt free flow of concrete in the chute.

Insley Steel Masts, Towers and Chutes are made in all sizes and combinations to fit any and every concrete job. Ask Insley!

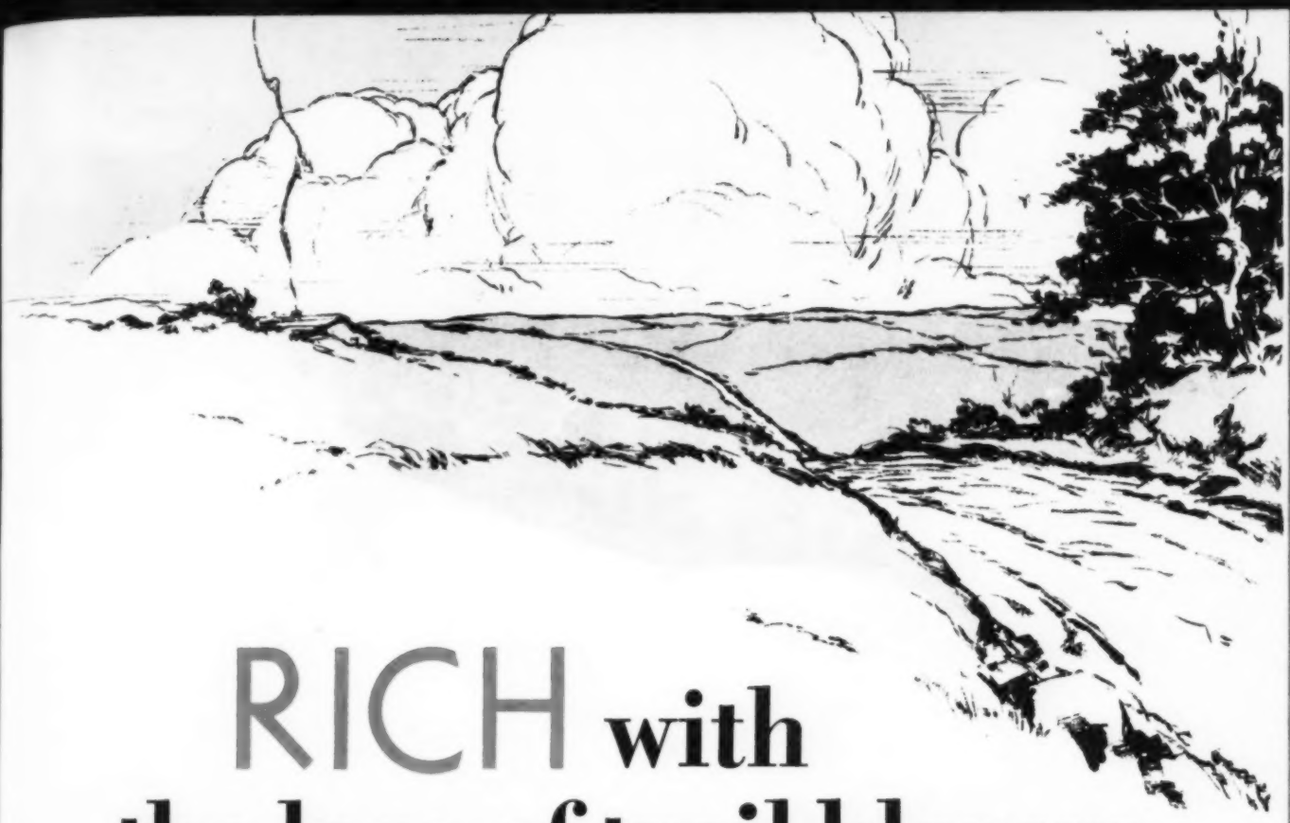


Insley Towers and Concrete Placing Equipment were used on the Raritan River Bridge shown here.

National Equipment Corporation

30th St. & Concordia Ave.
Milwaukee, Wisconsin

A 5776-I



RICH with the lore of trail blazers—

AUSTIN-WESTERN offers the most complete line of road construction and maintenance machinery ever made available. But this is not Austin-Western's only service to the road builders of America.

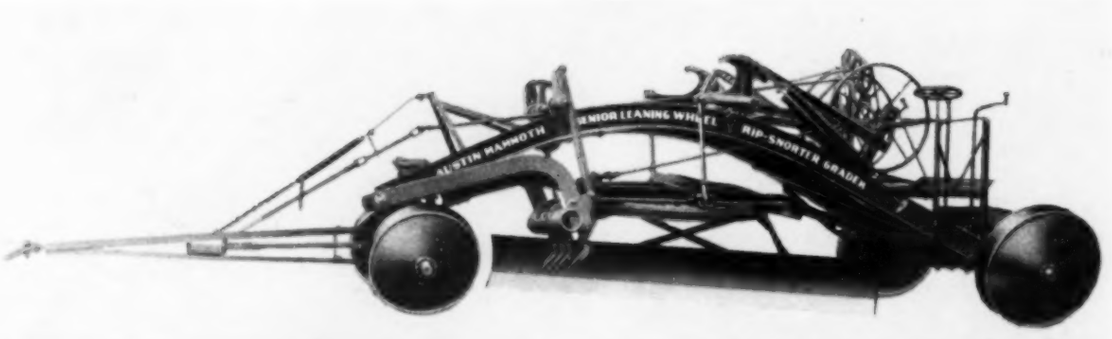
No less important to everyone concerned with building, using or paying for roads is the Austin-Western representative. Not only is he well known and respected in his territory—but he is *rich with the lore of trail blazers!* He knows equally well the problems of the old timers who carved the first dirt roads from the prairies, and those of the modern engineer and contractor concerned with time and yardage costs. He knows these things because, first and last, it is his house that has supplied road builders with equipment for their most important operations.

The Austin-Western representative is a specialist. His first purpose is to advise the most efficient and practical means of carrying out a program or meeting special conditions. Only after this step has been cared for in a truly professional way is the subject of specific equipment brought up.

Because his recommendations are always in good faith—and because experience has proven, again and again, that Austin-Western Road Machinery reduces labor and lowers costs—the Austin-Western man is a good man to know.

Austin-Western
ROAD MACHINERY

To cut the COST of doing a job



AUSTIN MAMMOTH SENIOR LEANING WHEEL RIP-SNORTER

THE first consideration on *any* road construction work is to keep costs as low as is possible without affecting the quality of the work done.

The Austin-Western line contains many sizes and styles of combined grader-scarifiers—two of which are described here. These machines are important contributions to modern road building methods. Not only do they *do* work in a single operation that formerly required several laborious operations—but they are ruggedly designed and built to stand up under the severest of service conditions.

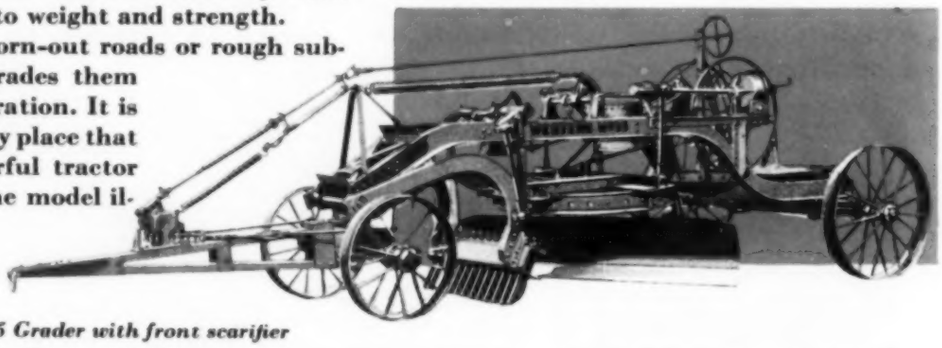
The Austin Mammoth Senior Rip-Snorter

This, the first combination grader-scarifier on the market, is still in a class by itself when it comes to weight and strength.

It tears up worn-out roads or rough subgrades and regrades them in a single operation. It is built to work any place that the most powerful tractor will draw it. The model illustrated is equipped with twelve-foot blades, leaning disc wheels with removable rims, and a two-piece, telescopic rear axle.

The Western No. 55 Grader with Scarifier

This sturdy machine will work successfully behind tractors of 40 hp. or less. While designed primarily for road building, it has weight enough for heavy maintenance work. It is an ideal two-purpose machine. There is *no lost motion between the hand wheels and the blade.* The regular blade is ten feet long, but twelve- or eight-foot blades may be had on order. Cut gears, ball and socket raising connections, and a new steerable offset engine hitch with enclosed worm gears running in grease—combine great strength with unusual handling ease.

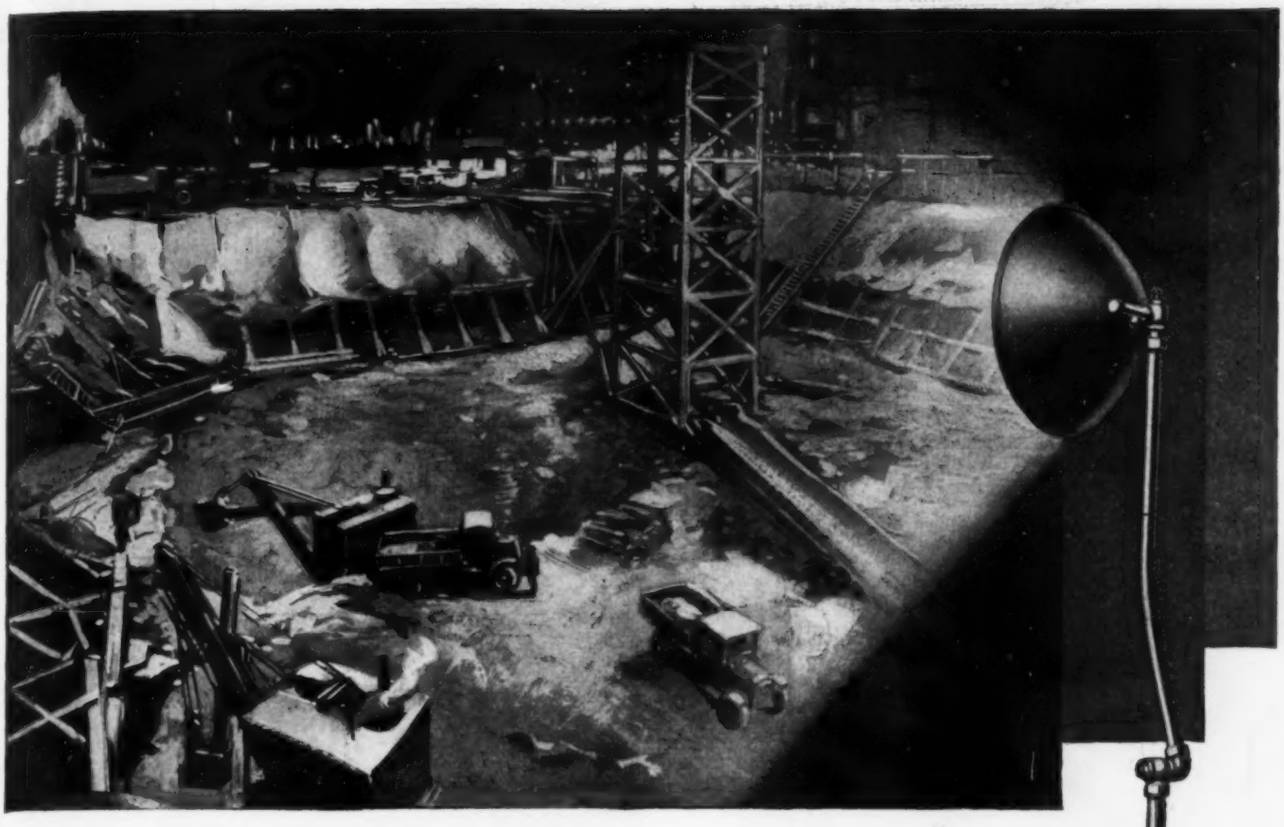


The Western No. 55 Grader with front scarifier

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue « CHICAGO, ILLINOIS » *Branches in principal cities*

Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers.



Be Prepared—
with CARBIC LIGHT

Wherever a quick portable source of night illumination must be had Carbic Flood Lights can be put into play instantly.

Are you adequately equipped with Carbic Lights?

Make sure of a sufficient source of good working light for every night job.

The Carbic Flood Light supplies strong, diffused illumination capable of penetrating fog, steam and smoke to a remarkable degree.

Carbic Lights defy wind driven storms,—are safe, convenient, and economical. Their simple, rugged construction guarantees years of continuous service.

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK CITY
Carbide and Carbon Building

UCC

CHICAGO
Carbide and Carbon Building

SAN FRANCISCO
Adam Grant Building

C.M. 8-30.

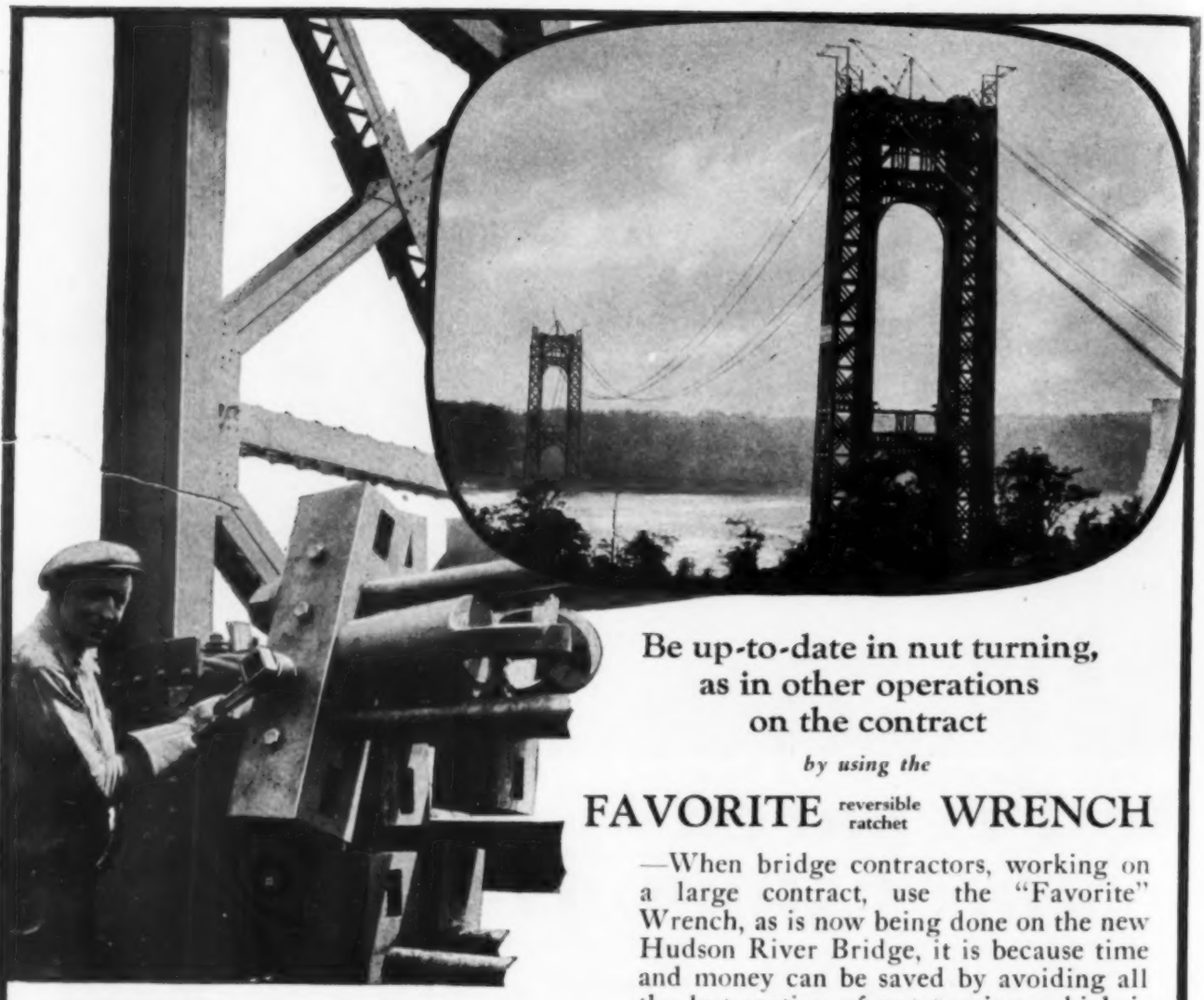
Oxweld Acetylene Company
205 East 42nd Street, New York, N. Y.

Without obligation, I would like to have additional information on Carbic Lights.

Name .....

Street Address .....

City ..... *State* .....



"Favorite" Wrench used on piers of new Hudson River Bridge at 176th St., New York City, being built by Port of New York Authority; cables constructed by John A. Roebling Sons Co.

Be up-to-date in nut turning, as in other operations on the contract

by using the

FAVORITE reversible ratchet WRENCH

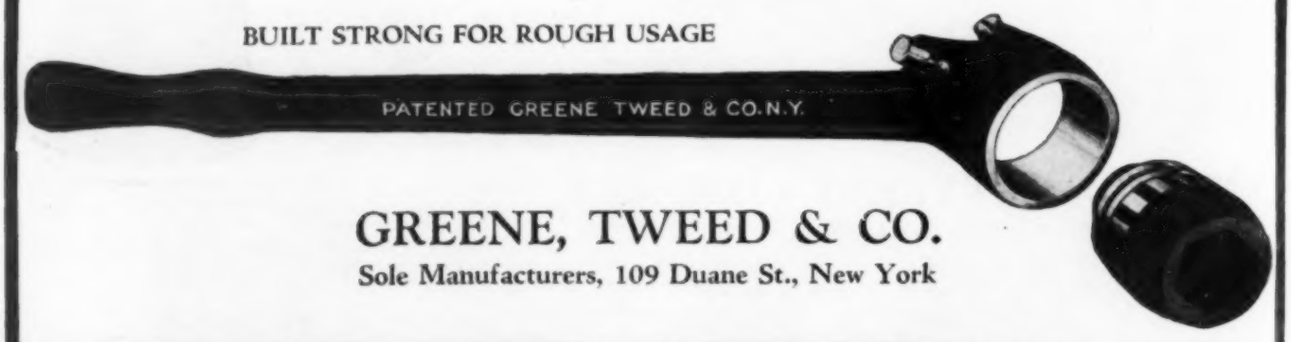
—When bridge contractors, working on a large contract, use the "Favorite" Wrench, as is now being done on the new Hudson River Bridge, it is because time and money can be saved by avoiding all the lost motion of nut turning, which is unavoidable with the old-fashioned open end wrench.

The "Favorite" Wrench works with a quick ratchet movement, and does not leave the nut until operation is completed. Has the socket form of head that bears on all sides of nut and so avoids slipping.

THE "FAVORITE" WRENCH IS IN EVERY SENSE A TIME-SAVING TOOL

Send for full particulars.

BUILT STRONG FOR ROUGH USAGE



GREENE, TWEED & CO.

Sole Manufacturers, 109 Duane St., New York

DOWN IN THE BAD LANDS OR UP IN THE MOUNTAINS!

DRAGGING a heavy load through the mud and ooze of a swampy river bed or laying a road high up on a mountain side—it makes little difference where the work is or what type it is when a Cletrac is on the job. Sure power—sure traction—and sure, all weather performance—fit Cletracs for the hard work and tough going of any locality.

Wherever sure-footed power is needed, Cletracs provide the ideal units. Strong, rugged, capable, they offer exceptional advantages and economies. Built in a line of five units ranging from 20 to 100 h. p.

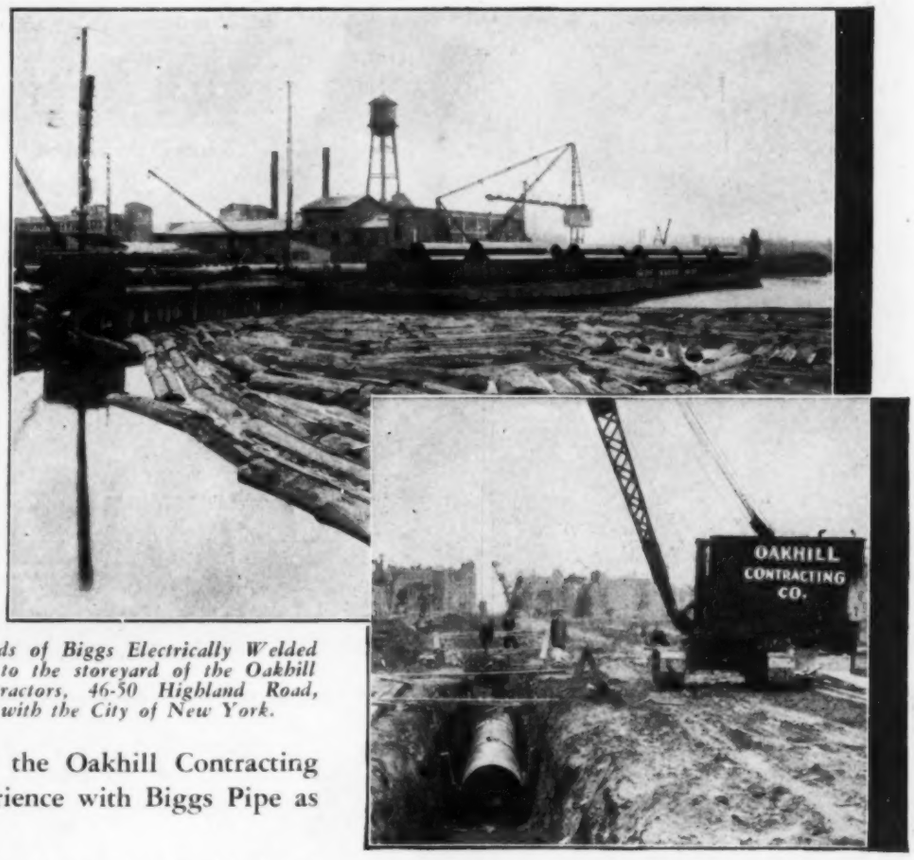
See your Cletrac distributor for a demonstration or write direct for complete literature.

THE CLEVELAND TRACTOR CO.
19323 Euclid Avenue Cleveland, Ohio

Cletrac
Crawler Tractors

BIGGS WELDED STEEL PIPE

New York City installs 17,500 feet of 48" and 60" diameter electrically welded steel pipe, this being the third electrically welded steel pipe line manufactured by Biggs for the Department of Water Supply, Gas and Electricity



A consignment comprising 15 carloads of Biggs Electrically Welded Steel Pipe being delivered by ferry to the storeyard of the Oakhill Contracting Company, general contractors, 46-50 Highland Road, Douglaston, N. Y., for their contract with the City of New York.

Albert Decker, President of the Oakhill Contracting Company, describes his experience with Biggs Pipe as follows:

"We have been very well pleased with the pipe furnished and the promptitude of deliveries.

"Shipments of both straight pipe and specials started on time, were received in their proper order, and we always had sufficient pipe on hand to prevent any hold-up in laying operations. The specials checked up very accurately, and we experienced no leakage in connection with any of the welded shop seams under severe tests."

Albert Decker, President, Oakhill Contracting Company, directs the installation of Biggs Welded Steel Pipe on the 91st Street and Alstyne Avenue job, Borough of Queens, New York City.

Mr. Decker's experience is typical of many contractors who rely on Biggs to furnish pipe on their contracts for major water works contracts. Biggs' years of manufacturing experience are coupled with an exact knowledge of contractors' requirements, springing out of actual field experience and projects of this character. This combination saves the general contractor annoyance and costly delays in the execution of his contract.

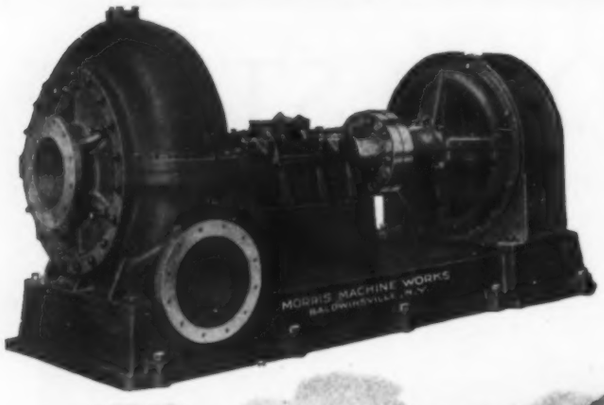
Biggs Welded or Riveted Pipe has the approval of leading water works engineers everywhere. It is the contractor's assurance of the prompt and satisfactory fulfillment of his contract obligations. The result is a decided preference for Biggs pipe. Why not let Biggs work with *you* on the next project in your territory?

SAFE
BIGGS WELD
DUCTILE
UNIFORM
STRONGER THAN THE PLATE ITSELF
Biggs

Biggs Electrically Welded Steel Pipe is in use on many large municipal and private water works projects.

THE BIGGS BOILER WORKS COMPANY
Akron, Ohio New York Detroit

For handling stones, gravel, abrasive material

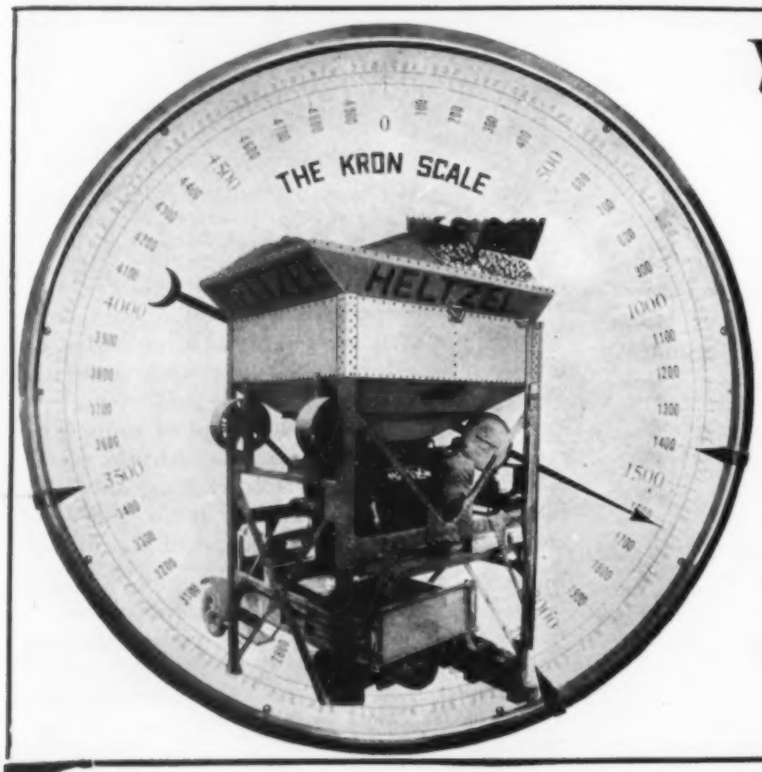


CONTINUOUS big production of heavy, highly abrasive material is best assured by the Morris Solid-Lined Dredging Pump because the renewable hard cast iron or manganese steel shell and disc liners can be removed and replaced with minimum expense and delay. The liners require no special fitting, and if a spare set is not at hand, spares for all the popular sizes can be shipped immediately from our plant. Material like that shown below can be handled economically by this type of pump through a lift of 80 feet or higher and through lines of up to a mile in length.

With these pumps, any solid materials (sand, gravel, small boulders, spoil, crushed rock, coal, ashes, etc.) that can be mixed with water and moved through a pipe, are easily transferred from one location to another. The only expense is for pump power and getting the material into the suction end of the pipe. **Write for bulletin.**

Morris Machine Works, Baldwinsville, N. Y.

Branches in principal cities.



You Can't Miss This Dial—

This big 3-foot dial can be read at a glance from any place on the platform.

Weight is shown on the scale the instant material drops into the batcher. Material is easily controlled—accurate weights are obtained rapidly.

Combined, these features assure profitable plant operation and reduce material losses to a minimum. Investigate this modern weighing plant. Literature at your suggestion.

The Heltzel way is the right weigh!

The Heltzel Steel Form & Iron Co.

WARREN, OHIO

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C.M.8-30

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Each operation entirely independent of all others;

Simplifies maneuvering;

Speeds up operation;

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Permits quick conversion to shovel, crane, trench hoe or dragline without a single change in levers or machinery.

This independent control is an underlying reason why Browning Cranes and Shovels consistently turn out more productive work at a lower handling cost.

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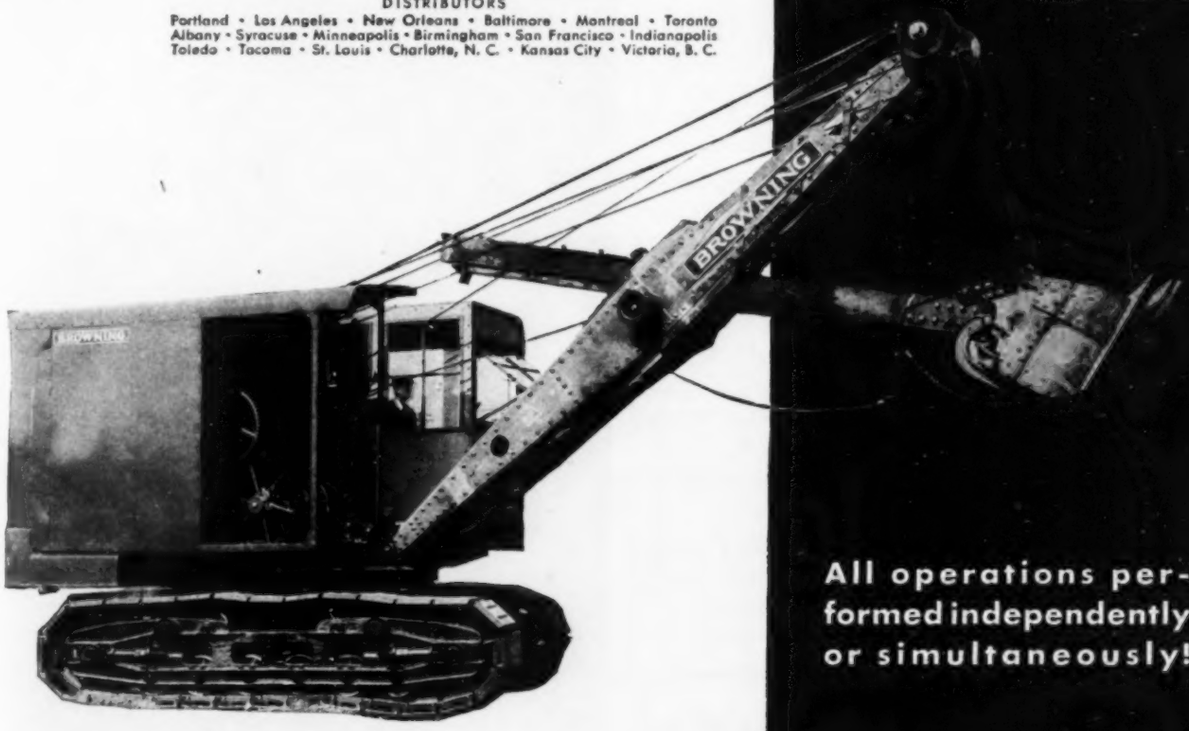
STEER
HOIST
SWING
RAISE OR
LOWER
BOOM



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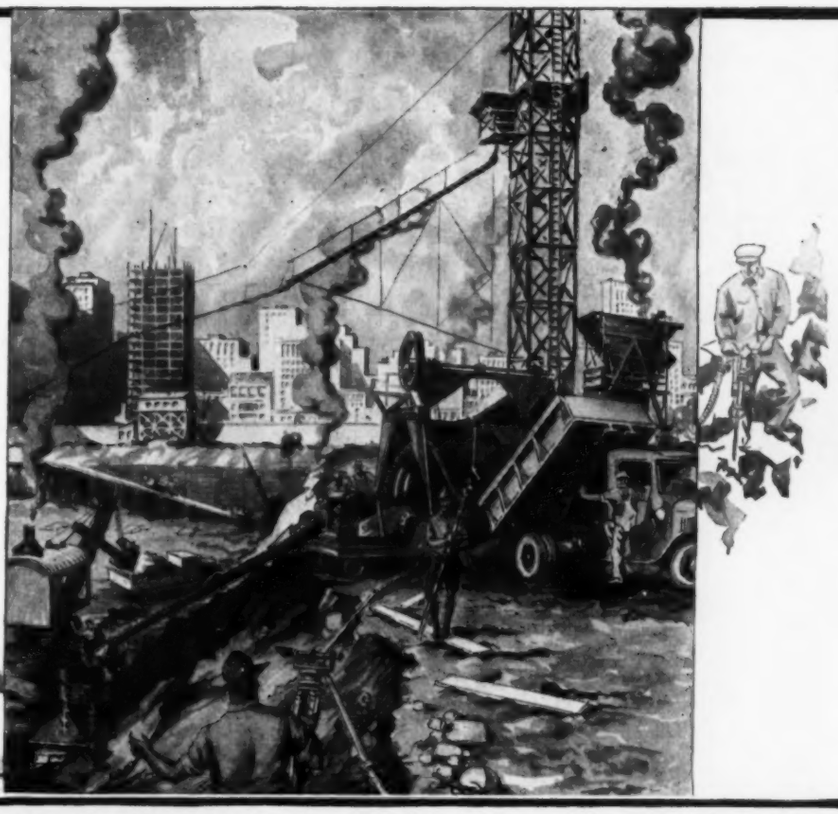

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BILLIONS of dollars will be expended in the United States this year for construction. Millions of dollars will be expended by contractors—large and small—for the new machinery and equipment needed to complete this gigantic program of building.

Many of these contractors will fulfill their equipment needs thru the Commercial Credit Construction Equipment Plan—a sound deferred payment plan, designed to allow payment from earnings. This plan has proved its merits in practice—allowing contractors to undertake greater jobs without increased capitalization.

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Give us full information, without obligation, about Commercial Credit Plans.

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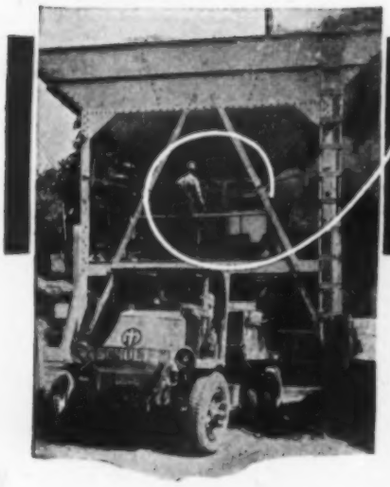

You can save *money

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Butler Weighing Hoppers

*Loss of loading time, over-weighing of aggregates and inaccuracies in batching — which must be corrected — may increase the truck time at the batching plant 50% to 250%.

BUTLER Weighing Hoppers are made with a full knowledge of field conditions and a wealth of actual contracting experience.

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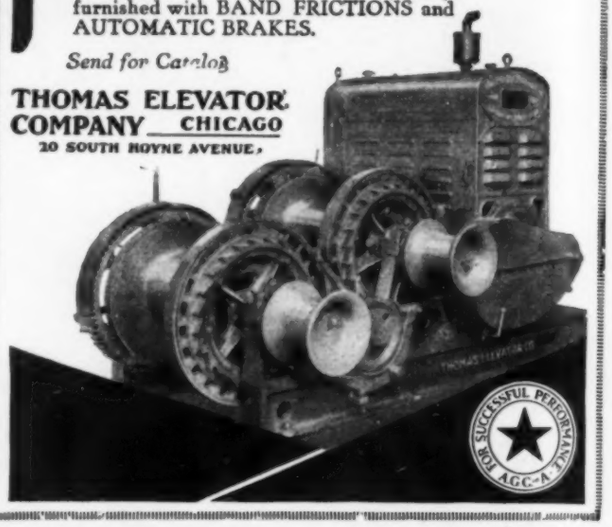

This up-to-the-minute

Pumping Handbook

Year after year this Novo Pumping Handbook is brought up-to-date to meet the requests of thousands of contractors, who are finding it a valuable aid in lowering their water handling costs. Consisting of a collection of pumping jobs from all over the country—on all types of work—detailed by pictures, facts and figures—the booklet can show you the way to better, cheaper pumping methods. Send the coupon today—no obligation.

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Please send me the Novo Pumping Handbook.

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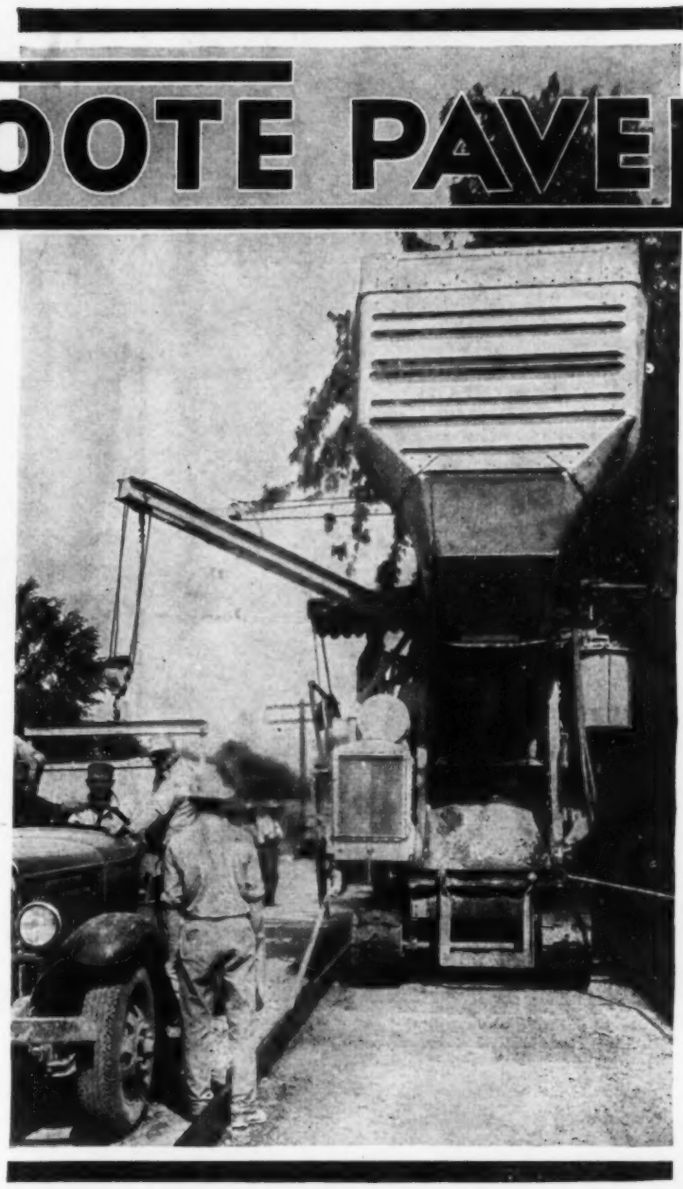
The Fast, Stream-Line Skip on the MULTI FOOTE PAVER



It handles every batch with the speed that is typical of every operation in the mixing and spreading of its concrete.

With either Truck-dump or Batch boxes, Multi-Foote makes that unusual yardage, day after day, with ease.

Equipped with Timken Bearings.

Hercules Six-cylinder Heavy Duty Gasoline Motor.

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ROGERS SETS A NEW STANDARD

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STRONGER-LIGHTER TRAILER

No form of trailer construction yet devised has equalled in strength-per-pound-of-material, the Rogers Goose-neck and H-Beam frame design.

Now, by the use of a lighter alloy steel, 50% stronger than structural, Rogers Brothers have set a new high standard in producing a trailer of *reduced weight*, yet with the same unequalled strength and factor of safety.

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New electric steel wheels, lighter and stronger, also help to reduce the dead weight, while the special spoke design centers the load directly onto the over-size, mill-type Timken Bearings.

These features are now incorporated, *with no increase in price*, in every model from the 7½ to the 80 ton.

Combining these with the distinctive Rogers design, which has not been altered, the Rogers can truly be said to set a new world's standard in heavy duty trailers even farther than ever before in advance of all competition.

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ROGERS BROTHERS CORPORATION

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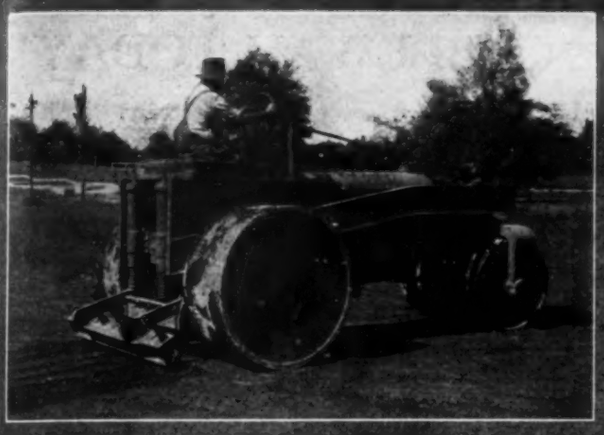
Wehr 3 to 7 Ton Road Roller



The New Wehr A-4 Grader

The Complete Wehr Line Builds and Maintains Good Roads and Good Profits

WEHR—The Pioneer—offers a line of road building and maintenance equipment that demands the attention of every highway man, township, county and state highway official!

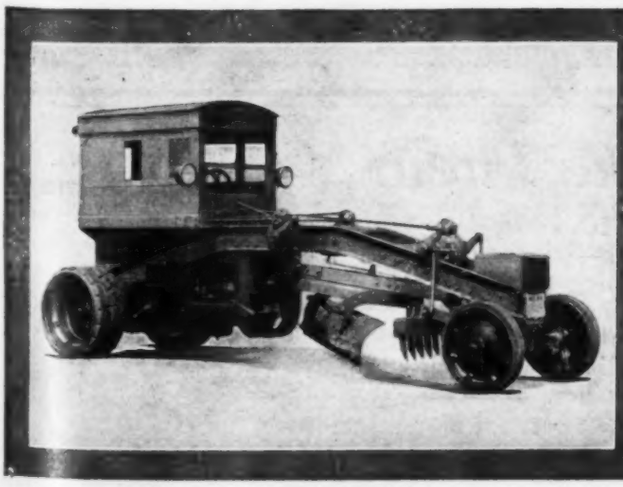
For every road construction and maintenance project, there's a Wehr unit to fit the job. Wehr One Man Power Graders, especially the new A-4 and the improved U-4, offer a large number of engineering features procurable in no other grader. The Wehr 3 to 7 Ton Road Roller is famous for its ruggedness and durability, apparent in the massive construction of this highly adaptable unit. Wehr also offers a new and complete line of pull-type graders, designed and built to handle every type of road work.

The development of the Wehr line is the result of the Wehr complete-service policy. A capable engineering staff, and a modern factory using up-to-date equipment, unite to produce road-machinery that is well-known throughout the world. Less cost and greatest production per mile of service are the results of Wehr construction, giving greater investment returns to the buyer of Wehr equipment. Write for full details of the Wehr line, stating what equipment you are particularly interested in.

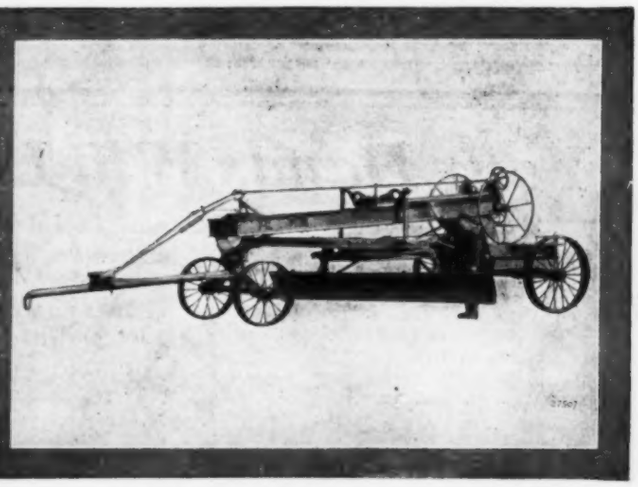
WEHR COMPANY, *Milwaukee, Wis., Factory: Cudahy, Wis.*

WEHR

ROAD BUILDING AND MAINTENANCE EQUIPMENT

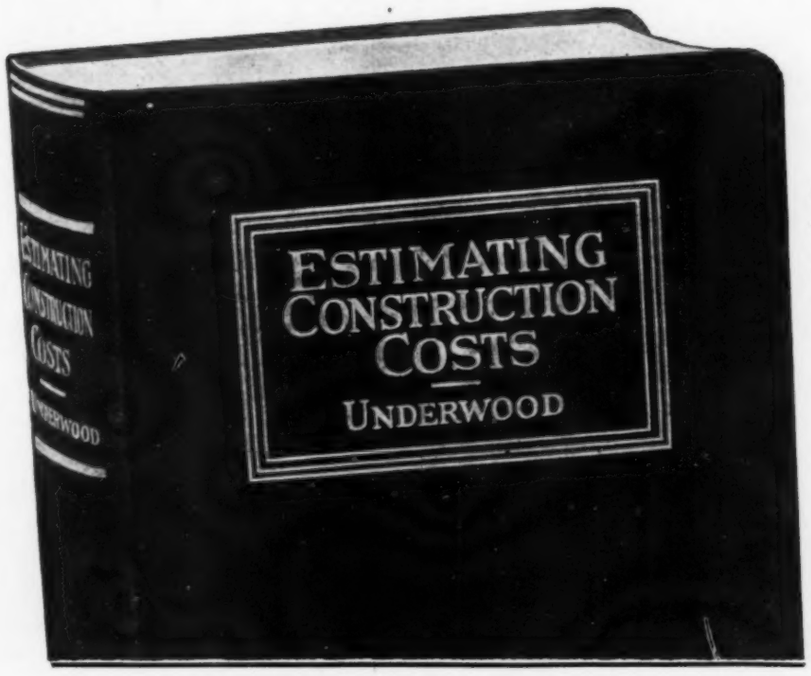


The Improved Wehr U-4 Grader



The New Wehr P-12 Pull-type Grader

Estimate Building Costs Quickly and Accurately by this easy chart system



Contractors—engineers—estimators—appraisers! Here is a new method of estimating construction costs! It is a time-saver and a labor-saver! Here, labor and material costs for every branch of construction work are presented by the simple and picture-like chart system. A glance at a chart takes the place of involved figuring. And, there are 443 of them, handy and ready for use every time you estimate. Here, the simplest and most direct plan of estimating makes your work easier and speedier.

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By G. UNDERWOOD, Construction Engineer

Author of "Standard Construction Methods"

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Enjoy this new tool that eliminates time and effort from estimating construction costs. All the lengthy and involved figuring, formerly a part of estimating can now be avoided by consulting the clear, systematic charts that make up the larger part of this book.

Furthermore, this book presents a complete guide to estimating construction costs. It describes what costs should be applied—taking up each process of making an estimate in the greatest detail. A complete model estimate illustrates the principles advocated in a step-by-step demonstration of this new and simplified method. Labor and material costs are clearly defined by this plan. The total cost of construction is divided into three parts: the cost of materials—the cost of labor—and the cost of equipment.

Covers Every Phase of Construction Work—

The 443 charts in this work are adaptable to all phases of construction work: Building and machinery installation—mixing and placing concrete—concrete forms for walls and floors—power shovel excavation—rock excavation—test borings—all the building operations, including plaster, bricklaying, plumbing and roofing—installing different kinds of piping—building coffer-dams of sheet steel piling—pile driving—timber bulkheads—trestles—steel erection—etc., etc.

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That's why more and more of you discard old open-end wrenches for Lowells—the reversible ratchet wrenches that once on the nut, stay there until it is driven tight. Just a steady *pumping* action, without lost time and energy for re-fitting.

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Catalog "R" will show you the type of Lowell Wrench you need—Write for it.

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WORCESTER MASSACHUSETTS

LOWELL REVERSIBLE RATCHET WRENCHES

ABSOLUTELY SELF-PRIMING!

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$460 F. O. B. Factory, 3-inch large capacity

No priming pumps or other complicated parts. Nothing to get out of order or give trouble And it costs less.

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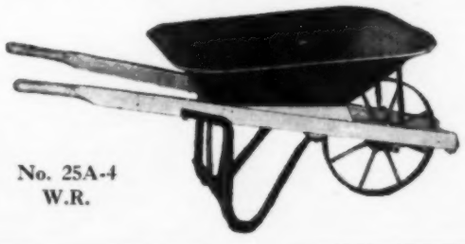

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THE quality of materials and conscientious workmanship which enter into the construction of Bull Frog wheelbarrows, no less than the superiority of design exemplified in their perfect balance and in the easy-running, long-wearing qualities of the exclusive "Never-Break" wheel, contribute to the long-lived stamina for which the Bull Frog line is famed. Contractors and builders who specify Bull Frog barrows, carts and scrapers know that this assurance of dependability on the job far outweighs any slight difference in cost. Inquire of your jobber or supply house, or write for catalog of the complete Bull Frog line.

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TOLEDO, OHIO
Branch Office and Warehouse: CHICAGO—520 W. Erie St.

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What Contractor Could Not Use This Handy Tool!

A Husky

SCREW PUNCH

A high grade electric steel casting with a tensile strength of 80,000 lbs. and GUARANTEED to do its work up to this capacity! All parts carefully machined and fitted. One look at the general construction tells the story of strength and long life! This is just one of the many famous Oswego Tools, fully described in the Catalog which will be sent you upon receipt of coupon.

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